

THE No.1 SCALE AIRCRAFT REFERENCE MAGAZINE

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Fold Out
**SCALE
PLANS**
INSIDE



Wessex Winds Down

by J. B. E. Hale

The first and the last: XR497, the first production Wessex HC.2, was still in service with No.72 Squadron at the end. Now, a new life awaits this aircraft in far-off Uruguay

XR497 receives routine maintenance on the line at RAF Odiham at the end of March

Time is almost up for the Wessex. March 2002 saw No.72 Squadron, the last squadron to be equipped with the Westland Wessex in Great Britain, retire their aircraft into storage and disband. The penultimate chapter of the history of the Wessex in the Royal Air Force had been written.

No.72 Squadron was the second RAF squadron to receive the Wessex HC.2, so it was only fitting that it should have been the second to last squadron to retire the aircraft. No.72 Squadron did not intend to allow the retirement of the Wessex in its home country to go unnoticed, flying in its aircraft to the RAF's main storage unit at RAF Shawbury in a stately progress from its base at RAF Aldergrove in Northern Ireland over a period of three days. The photographs illustrating this article were taken during these last days of Wessex operations.

Only No.84 Squadron at RAF Akrotiri in Cyprus continues to fly the Wessex; operating five Wessex HC.2, its aircraft provide Search and Rescue support to the British forces based on the island of Cyprus. They are also available to assist United Nations troops in peace-keeping operations on this divided island. The Wessex's remaining time with No.84 Squadron is short, however, as it is scheduled to retire its Wessex next year. 2003 will thus see the Wessex finally retire from the Royal Air Force after 39 years of service.

Twin-engine

Based on the successful Sikorsky S-58 helicopter (given the designation H-34 in U S military service), Westland





© All photographs by the author

1. The Wessex was renowned for its easy accessibility to most major systems

2. Detail view of the tailwheel. Note the prominent mushroom-head rivets of the airframe and the stencilling

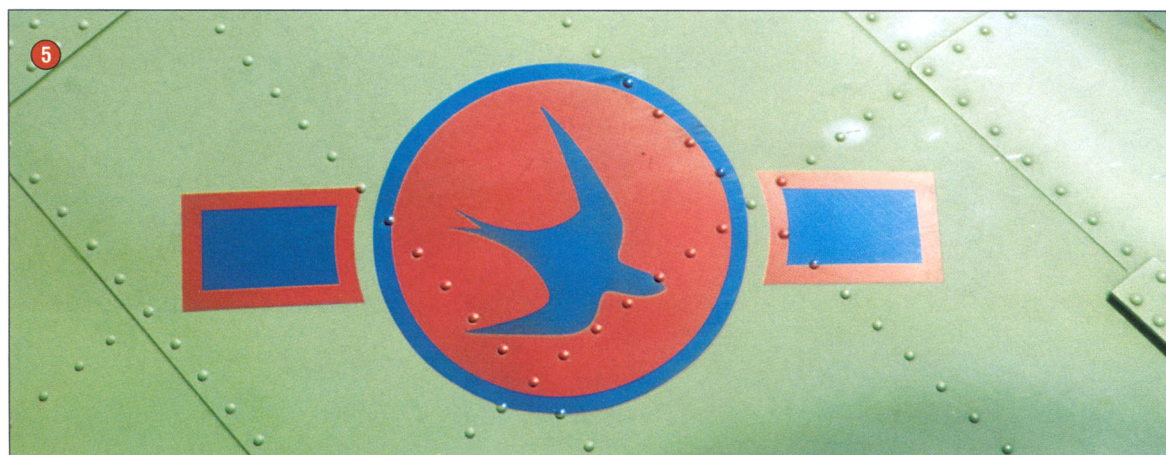


3. XV721 takes-off from the grass at RAF Odiham, giving joyrides to the Press. Seen on a sunny day, the camouflage scheme of Medium Lichen Green and NATO IRR Dark Green was quite attractive

4. The final touchdown! No.72 Squadron arrives at RAF Shawbury on the 27th March 2002, the last day upon which the Swift emblem of No.72 Squadron could be seen in flight. As may be seen, one of the rotor blades of the squadron's Wessex was painted yellow, to enhance the visibility of the aircraft from above when operating in the SAR role



5. The squadron badge, as carried on the squadron's aircraft. The motto carried on the squadron badge was 'Swift' - approved in 1938 when No.72 was a fighter squadron, but a little incongruous when applied on the stately Wessex! A 1:72 scale decal of this marking may be found on Modeldecal Sheet No. 95





Some of the Wessex of No.72 Squadron carried names: 'Jennifer' is XV726, one of the last HC.2s off the production line at Yeovil. The fixed undercarriage was robust, and greatly aided the Wessex in its tactical role

Helicopters Limited secured a licence to produce variants of this aircraft for use with the Royal Navy, following on from their earlier agreements to build the Sikorsky Dragonfly and Whirlwind. The Sikorsky design was modified by the adoption of a gas-turbine powerplant to give it greater lifting capacity, and entered service with the Royal Navy as an anti-submarine helicopter. Use of the Wessex in a troop-carrying role was pioneered by the Royal Navy, a dozen Wessex HAS.1 having their sonar and automatic flight control equipment removed to provide room for a contingent of Royal Marines in the cabin. These conversions were operated by No.845 Naval Air Squadron for three years until a purpose-built aircraft (the Wessex HU.5) became available.

The Royal Air Force had a requirement for a powerful general-purpose helicopter, and an upgraded version of the Wessex was selected. The HC.2 troop-carrying variant for the RAF was a more powerful development of the HAS.1, introducing a pair of Bristol-Siddeley Gnome turboshafts in place of the single Napier Gazelle of the earlier aircraft. Before construction of the HC.2 prototype, two pre-production HAS.1 airframes were converted to interim HC.2 standard to develop the engine and control systems. Ordered in August 1961, the HC.2 was designed as a short-range tactical troop-carrying helicopter, with provision to act as an assault helicopter if required: the aircraft could carry up to

four Nord SS.11 or AS.12 wire-guided missiles or two 2-inch rocket pods when configured for this role. The cabin was able to transport fourteen troops, and an underslung load of 4,000lbs could be carried.

Total Wessex HC.2 production for the RAF was 71, plus the prototype; this aircraft subsequently entered operational service, bringing the total of operational Wessex HC.2 to 72. The last two HC.2 airframes on the production line were completed as HCC.4 aircraft for VVIP duties with The Queen's Flight. In addition to its more warlike duties the Wessex also served in the SAR role, the yellow-painted Wessex of No.22 Squadron being a familiar sight on the TV news for over 20 years.

Swift

The Wessex HC.2 first entered RAF service with No.18 Squadron in February 1964. Based at RAF Odiham, the squadron bolstered the strength of the helicopter force of No. 38 Group, RAF Transport Command, which comprised No.225 Squadron's Whirlwind HAR.10s and the Bristol Belvedere heavy-lift helicopters of No.72 Squadron. Six months after the arrival of No.18 Squadron with its new aircraft, No.72 Squadron exchanged its tandem-rotor Belvederes for the more nimble Wessex HC.2 in August. Although No.72's period with the Belvedere had been short, the squadron came to the notice of the wider world when the Commanding Officer used his skills to lift the spire of the new Coventry cathedral into place during April 1962.

The emblem in the squadron badge is the Swift, emphasising speed. This was ironical during its long years of service with helicopters, when its aircraft were anything but! Prior to going rotary in 1961 when re-equipping with the Belvedere, No.72 Squadron had enjoyed a long history as a fighter squadron. Re-formed in February 1937 at RAF Tangmere, the squadron introduced the Gloster Gladiator into RAF service. Replacing its biplanes with the Spitfire in April 1939, the squadron flew with distinction throughout the Second World War, flying in the Tunisian and Italian campaigns after home-defence duties. Post-war the squadron was successively equipped with Vampire, Meteor and finally Javelin aircraft in the day, night and all-weather fighter roles.

Troubles

When the squadron received its first brand new Wessex in August 1964, it could not have been foreseen that most of the squadron's service life when equipped with the Wessex would be spent in Northern Ireland. The increase in tensions in Northern Ireland during 1969 and subsequent transfer of British troops to the Province in a peace-keeping role led to a detachment of Wessex from No.72 Squadron being based at RAF Aldergrove to support the Army and the Royal Ulster Constabulary. With no end to the situation in sight at the time, it was decided to transfer the entire squadron to Northern Ireland in November 1981, where the squadron remained until March 2002. Strength of the squadron was bolstered in January 1997 when a second Flight, equipped with the Puma HC.1, was added. These latter aircraft have now been incorporated into an enlarged No.230 Squadron, also based at RAF Aldergrove.

The Wessex proved to be an ideal helicopter for the Province, being able to insert or recover troops in very small landing sites. Its rugged construction and tailwheel undercarriage meant that troops could be rapidly inserted in a shorter time than by the more modern, but more delicate, types, and its relatively short range was not a drawback. In



the last three decades, No.72 Squadron crews have received twelve Air Force Crosses, three Queen's Commendations and twenty-two Mentions in Despatches for their work in support of the security forces.

In addition to its tasking in support of the security forces, a secondary duty of the squadron was Search and Rescue. Although limited to daylight hours only, the Wessex lacking the sophisticated navigational and bad-weather flying aids of more modern aircraft, the squadron still managed to save some 600 lives during its time in the Province; apparently, this total includes three cows!

RAF Shawbury

The Wessex's service in Great Britain came to an end when the last ten Wessex of No.72 Squadron were placed into storage at RAF Shawbury upon their arrival on 27th March. No.72 Squadron ensured that the retirement of the Wessex would not go unnoticed, planning a series of formation flypasts of significant airfields and sites relevant to the Wessex in its four decades of service during the journey from RAF Aldergrove. Bad weather on the initial leg of the flight from RAF Aldergrove on the 25th March caused a change of route, No.72 Squadron making an unplanned refuelling stop at RAF Shawbury prior to arriving at its destination of RAF Odiham, where the squadron stayed for two days. RAF Odiham had been the home of the first Wessex to enter service with the RAF, and was for many years the main base for Wessex operations. Unfortunately, a planned formation flight by No.72 Squadron over London to commemorate the passing of the Wessex was not authorised. This was an ungrateful decision by the authorities, considering that no objections were raised to the squadron's Spitfires being given the freedom of the skies over London during the Battle of Britain in 1940...

After a Press Call hosted at RAF Odiham on 26th, the protracted journey into storage at RAF Shawbury in Shropshire was concluded on 27th March. The aircraft will

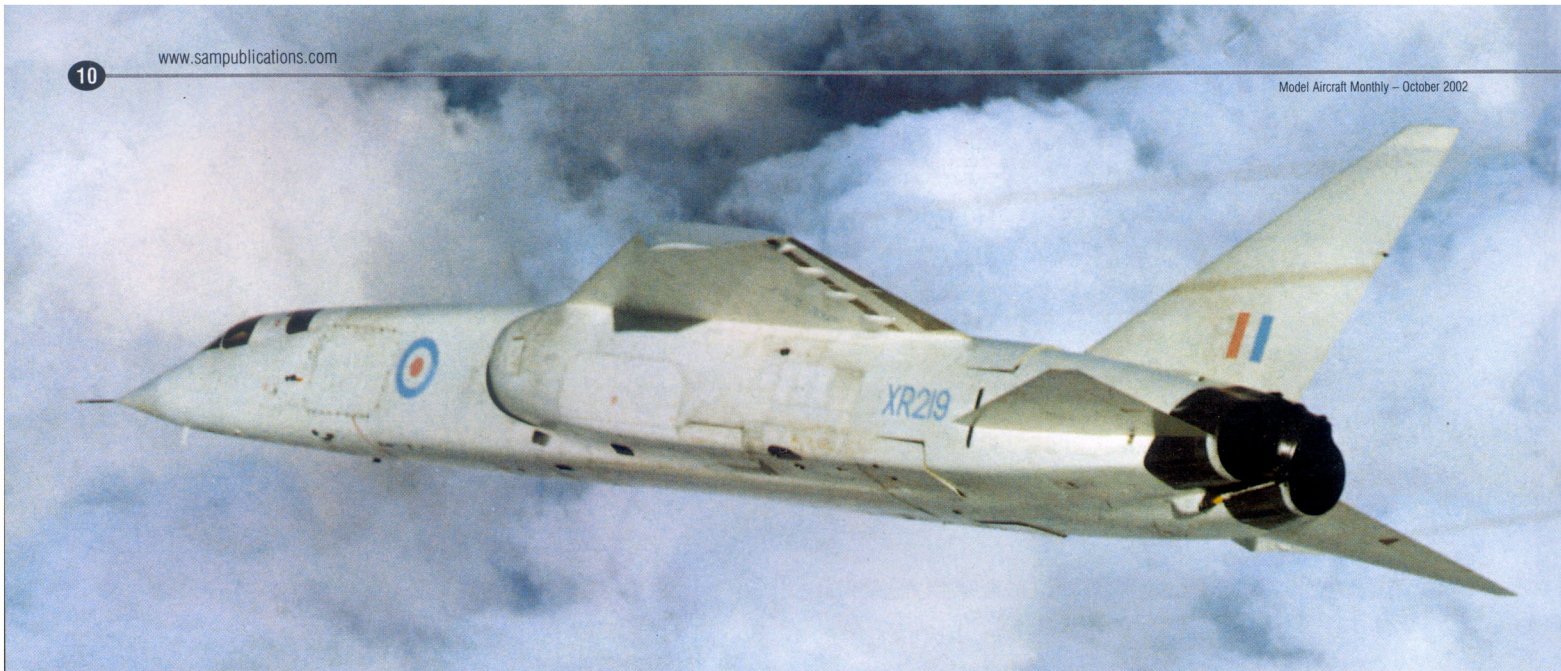
be held at Shawbury until replacement of the last operational Wessex with No.84 Squadron in Cyprus is completed, in case one of its aircraft is seriously damaged and requires to be replaced, or major spare parts are needed during the interim period to keep No.84's aircraft flying. However, some of No.72 Squadron's old mounts have already successfully escaped the attentions of the scrapman and found new homes, Uruguay having purchased two aircraft to supplement the eleven Wessex HC.2 they acquired from the RAF five years ago.

Although some of its last aircraft will manage to fly on, regardless of its long history of service any future return to the skies by No.72 Squadron is uncertain. Although it has a proud past as a fighter squadron, the shrinking Royal Air Force (despite the never-ending increase in commitments placed upon it by the Government) may never see an increase in active squadron numbers which would enable the Swift to fly once more. **MAM**

XV721 is seen at rest outside one of the hangars at RAF Shawbury. This station had been responsible for the major servicing of the Wessex fleet during the latter part of its RAF service

Detail view of the tail rotor. The Swift badge faces forwards on each side of the fuselage





TSR.2 - What might have been!

by Andy Evans

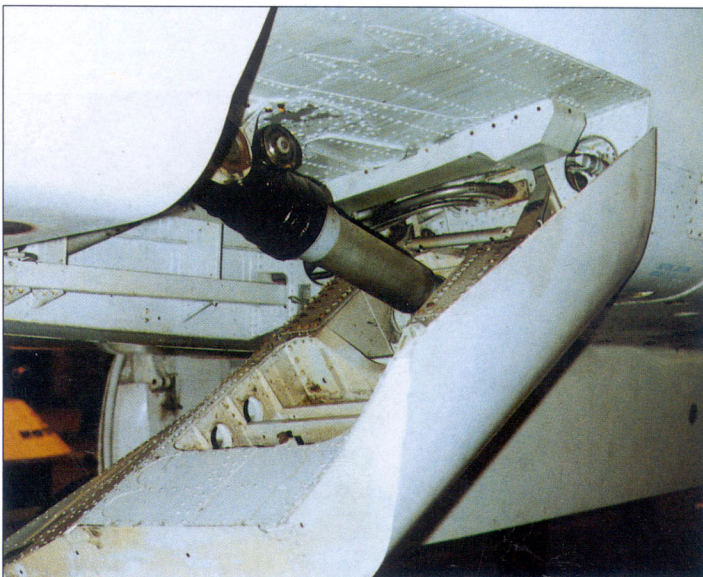
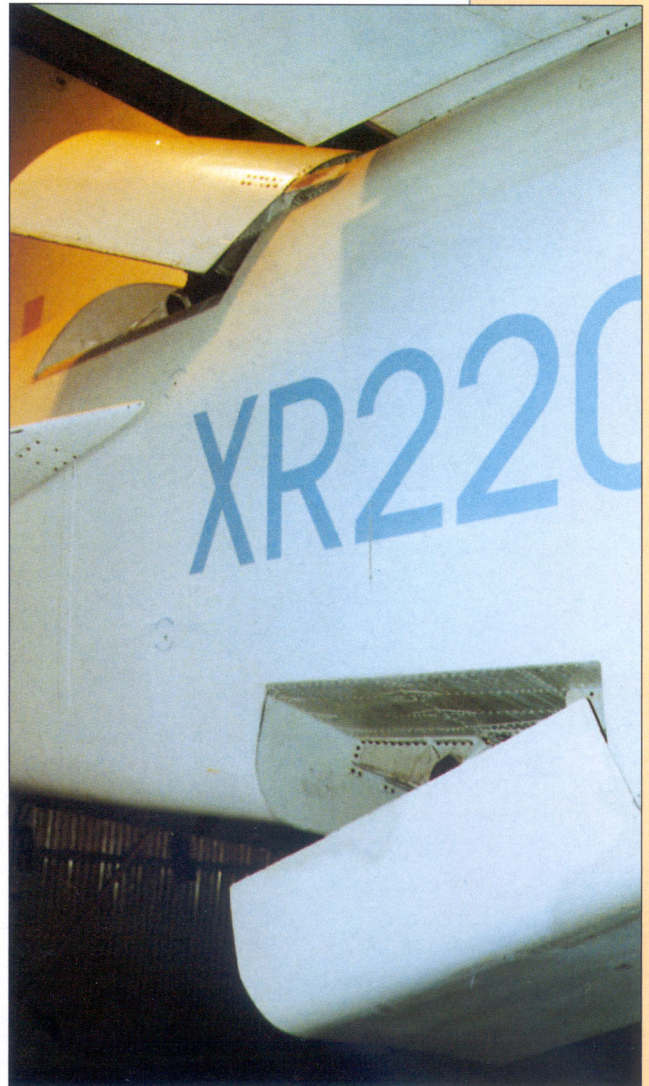
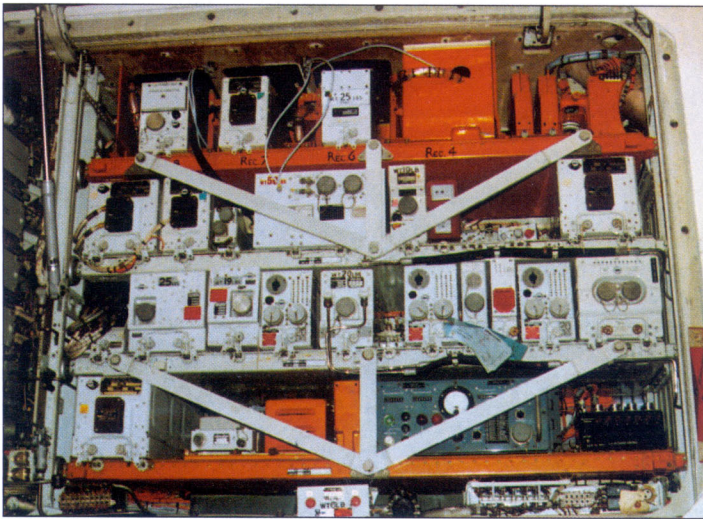
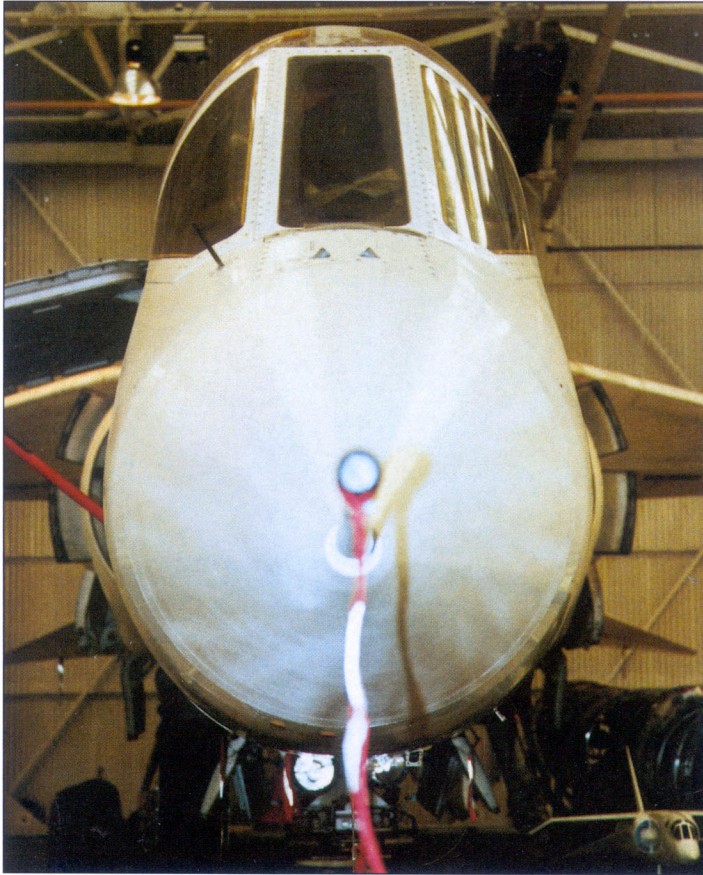
In 1955 the RAF Operational Requirements Branch began to consider a possible successor to the Canberra bomber. The advent of supersonic fighters and surface-to-air guided weapons made the high-level bomber vulnerable, unless much greater speed could be attained and stand-off weapons provided. The alternative was to take the aircraft down to really low levels, where radar and guided missiles were least efficient and fighters had difficulty in finding their targets. The Royal Navy was also taking the idea of a low-level bomber seriously, and in 1955 Blackburn Aircraft began development of the NA.39, (later called the Buccaneer) whose mission profile was a toss-bombing attack with a nuclear weapon. In February 1957, Defence Secretary Duncan Sands published his infamous Defence White Paper, which stated that the Air Force was 'unlikely to require' any new fighters or bombers. Despite this, General Operating Requirement (GOR). 339 was issued in September 1957, calling for a new bomber for the RAF, which should have supersonic performance at all levels, sophisticated electronics and the ability to operate from short runways. It also required a 1000-mile combat radius (i.e. to the USSR), thereby adding a strategic dimension.

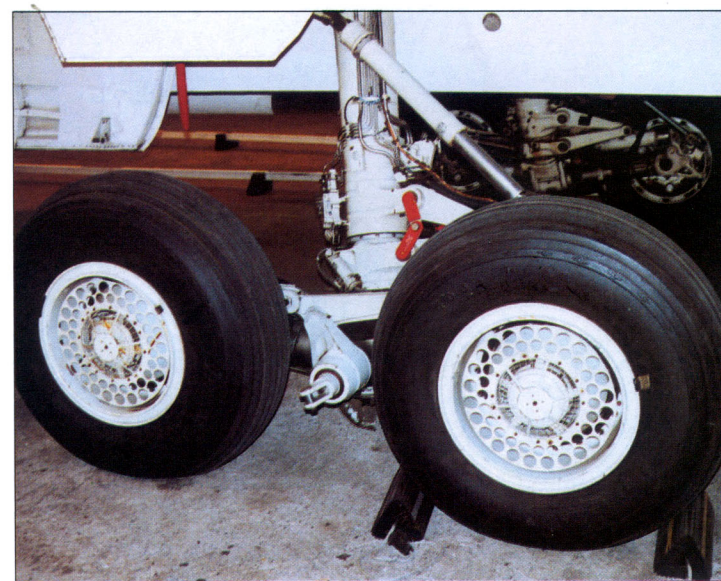
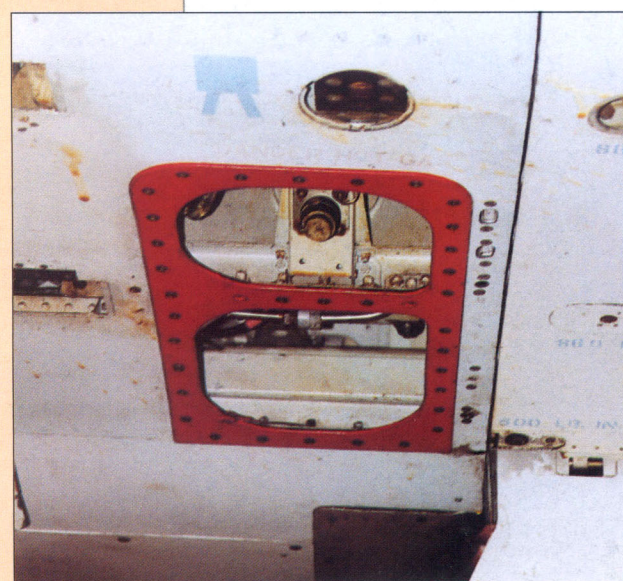
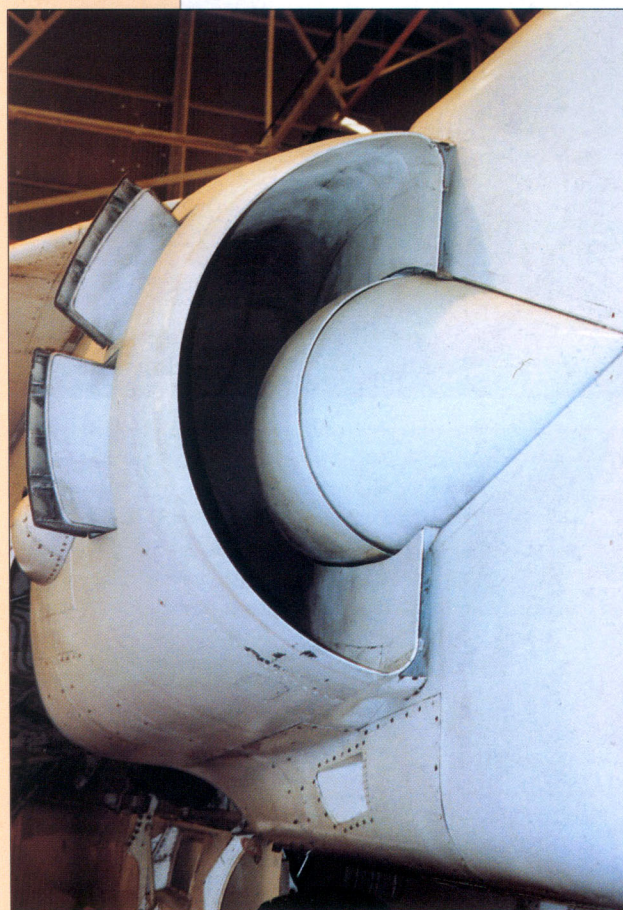
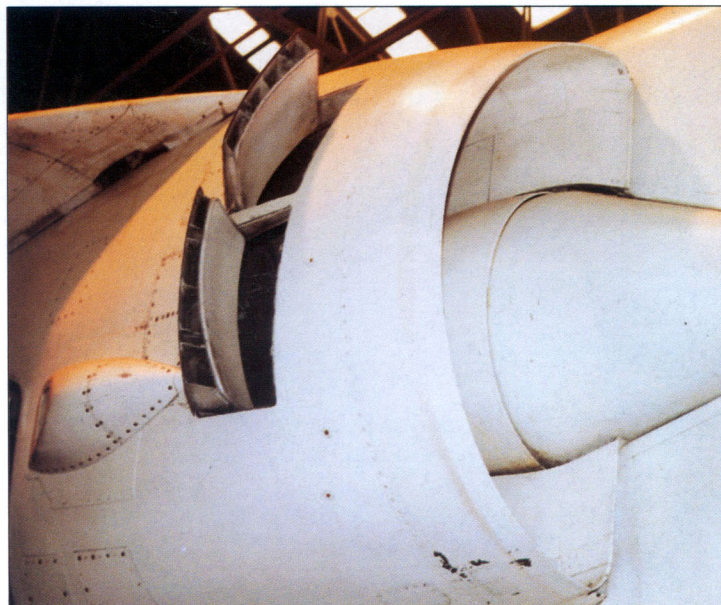
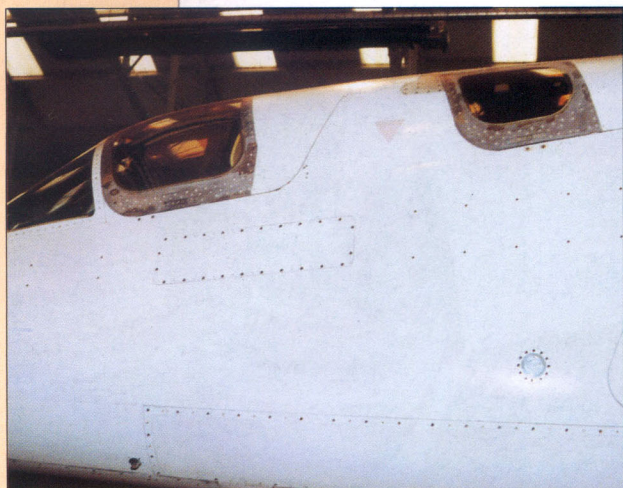
Proposals were submitted by Avro, Blackburn, Bristol, Fairey, English Electric, Handley Page, de Havilland, Short Brothers, and Vickers. It was suggested that the RAF utilise the Blackburn NA.39 design to meet their requirements, but this garnered a hostile response to fulfilling the GOR.339 requirement with the Blackburn design. The RAF deemed NA.39 unsuitable because it was subsonic, had too short a range, required too long a runway, and had an insufficiently advanced bombing system.

To produce the new aircraft, a tie-up between Vickers and English Electric was the Government's preferred option. The

aircraft requirements were laid down as having to be capable of speeds of Mach 1.1 at 60m and Mach 2 plus at medium altitude. On internal tankage, a radius of action of 1850km was required, of which 180km was to be flown supersonic at altitude, and 360km into and out of the target area at Mach 0.9 at sea level, and the aircraft had to be able to take off from 600m rough strips. A fully automatic navigation system was called for, to give a nuclear lay-down accuracy of 200m (50% CEP). Automatic terrain-following was a primary requirement, plus a low gust response for minimum crew fatigue, a long structural life and a high thrust/weight ratio. Also required were a high-resolution radar, active line-scan and full photographic reconnaissance equipment.









On 1st January 1959 the Government announced the award of a contract to Vickers-Armstrong and English Electric for a new light bomber to be known as the TSR.2. In a marked departure from tradition, the new aircraft was not given a name. The Minister, Aubrey Jones, said that it was a 'Tactical Support and Reconnaissance' aircraft, although in all subsequent documents the middle word was changed to 'Strike', which reflected the fact that the basic role of the aircraft changed from battlefield support to strategic strike deep into enemy territory.

In October 1964, a Labour government was elected. It wanted to reduce the defence budget, and also had an antipathy to the British aircraft industry. Thus, costly TSR.2 was the logical target for cancellation. A review of the TSR.2 programme was prompted, and a number of foreign types were considered to replace it, including the American TFX (F-111). On January 15th 1965, the Secretary of State for Defence expressed the view that the TSR.2 should be cancelled, along with the P.1154 and the HS.681. He stated the TFX would be a cheaper option, although it was admitted that costs might rise, as this aircraft was still in an early stage of development. At the end of January, it was decided to defer a decision until a closer comparison of the TFX and the TSR.2 had been made. The final decision was made in two Cabinet meetings on April 1st and an option for the F-111A was secured before announcing the cancellation. On April 6th 1965, the Chancellor of the Exchequer, James Callaghan, announced the cancellation of the TSR.2 in his Budget speech. The Secretary of State for Defence, Denis Healey, explained that the government had been very reluctant to do so, but that the cost of the TSR.2 program was becoming an 'intolerable burden'. Healey continued to say that Britain could no longer afford to go it alone in the development of combat aircraft. He went a step further when he announced the government's intention to reduce the number of

strike aircraft that would be bought for the RAF. He also mentioned that the government did intend to buy a new strike aircraft, the General Dynamics F-111A, and that this could be done for less than half the price of the TSR.2 program. The final twists in the saga are that the F-111 was ordered for the RAF, and then cancelled; instead it was decided to buy the F-4 Phantom II. The government however, could not be seen to be buying an inferior American aircraft after this fiasco, so specified that British engines were to be used. The UK Phantoms were to use Rolls-Royce Speys, an engine generally thought to be unsuitable for a fighter. Problems with the Spey and Phantom marriage meant that not only were British Phantoms the most expensive of all, but they also performed nowhere near as well as the original US models. TSR.2 was now long gone, and all the UK had in its place was an aircraft of nowhere near the capability. Not only did the Phantom not come close to fulfilling the TSR.2's role, it could not adequately fulfil narrower roles such as air defence. The ageing Lightning continued to outfly Phantoms until its retirement in 1988. The final chapter reads that the formerly scorned NA.39 (Buccaneer) entered service in 1969 in the low-level strike role, replacing the Canberra.

Construction

Structurally TSR.2 consisted of five main elements: two centre fuselage sections, the nose section housing the two crew in tandem, the tail section with the fin, and the complete wing. Since about 80% of the fuel was carried in the fuselage, the structure was designed as an integral tank, with fuel in the forward tanks extending aft from the equipment bay to a point between the air intakes, and with rear tanks built around the engine tunnels. The light alloy fuselage structure consisted mainly of skinstringer panels supported by transverse bulkhead frames. The panels were largely machined, with chemically etched skins. The high-temperature alumino-silicate windscreen was capable of withstanding a 0.5kg birdstrike at transonic speed. Systems and installations were routed through the lower fuselage to improve access. In the rear fuselage were the two Olympus engines, the engine and jetpipe tunnels forming an integral part of the fuselage. The delta wing was built as a single box and was used as an integral fuel tank. The total amount of fuel carried was 25,425lt. Two pylons could be fitted under each wing, to carry missiles, bombs, or more fuel. The fin and the tailplane were of the all-moving type; the tailplane sections could move in unison to provide longitudinal stability, or differentially for lateral control. The twin bogey undercarriage was capable of accepting an emergency landing at maximum take-off weight and, with low pressure tyres, allowed operations from unpaved surfaces. The small, highly loaded wing gave a smooth ride at very low altitude, but to achieve the requested take-off and landing performance, the entire wing trailing surface was fitted



with blown flaps. They could be turned down to 50° for landing; the take-off setting was 35°. Four air brakes were fitted on the aft fuselage, in the narrow gap between the wing trailing edge and the tailplanes.

The engine intakes were of half-circular type, with movable shock cones. There were auxiliary intake doors behind the lips of the main intakes. The Bristol Olympus 22R Mk.320 engines were twin-spool axial-flow engines, with variable afterburners and water injection. They were designed for sustained cruise at Mach 2, a feature, which would be used later in Concorde. Each engine was to give 87.5 kN dry thrust, and 136.7 kN with full reheat. A 365lt water tank, for injection purposes, was fitted between the jetpipes. An auxiliary power plant was fitted in the fuselage forward of the weapons bay, and this provided low-pressure air for engine starting, AC electrical power for fuel pumps, throttles and the inertial platform, ground running of main engine gearboxes and air conditioning. Four self-contained hydraulic systems were installed to provide duplicate power controls, and electrical power came from two engine-driven generators, while air tapped from the engine compressors provided pressurisation and air conditioning. The development of the Olympus 22R engine was not without problems. In December 1962 an engine fitted to a Vulcan testbed exploded during ground running! The engine problems had not been completely cured by the time of the aircraft's cancellation.

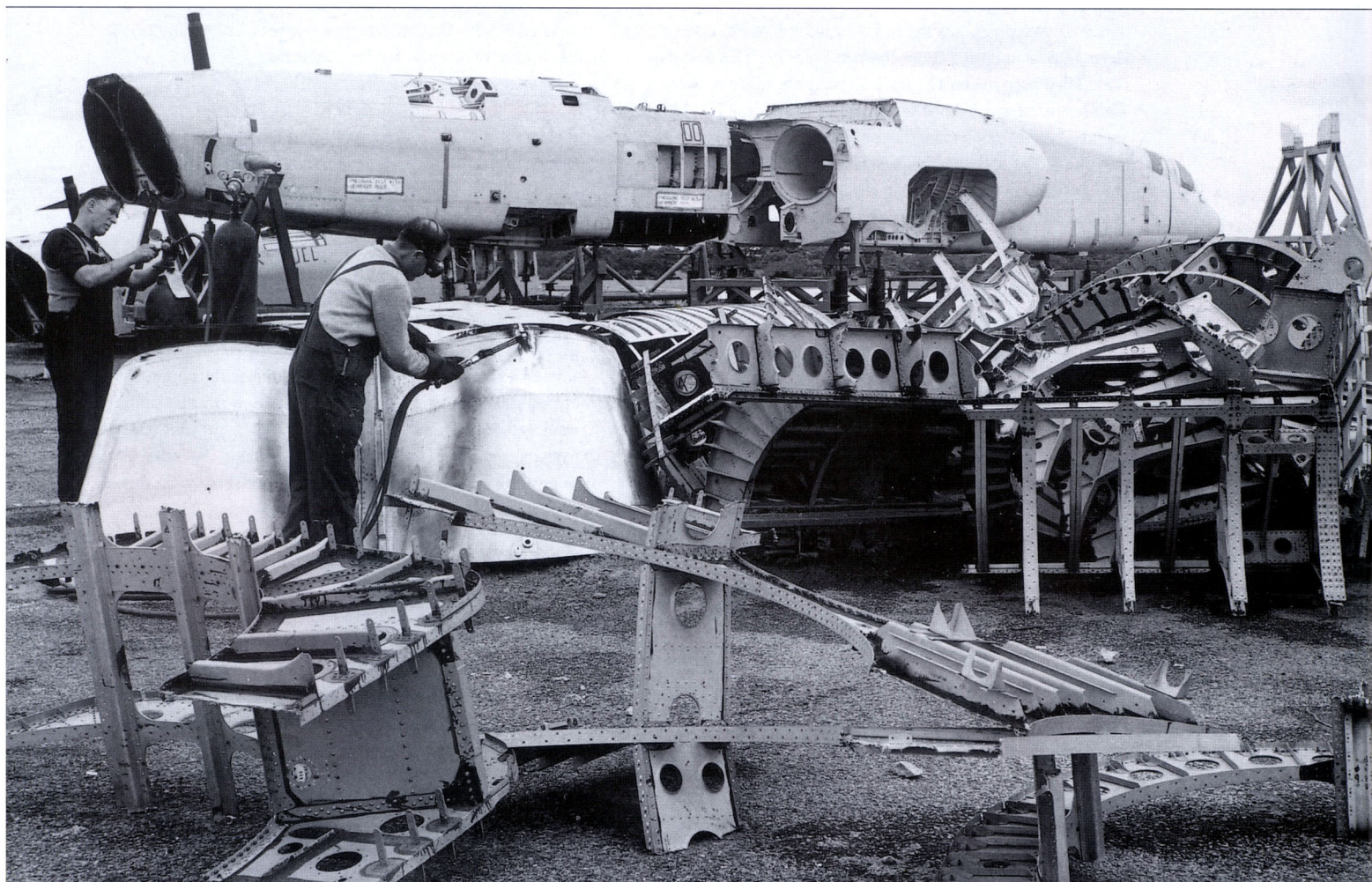
The navigation system was designed to be independent of ground aids. Before take-off the sortie flight plan was fed into the Verdan digital computer. Navigation was based on dead reckoning using Doppler, the inertial platform and air data computer as sources. In the event of failure the system could continue on Doppler or inertial reference alone.

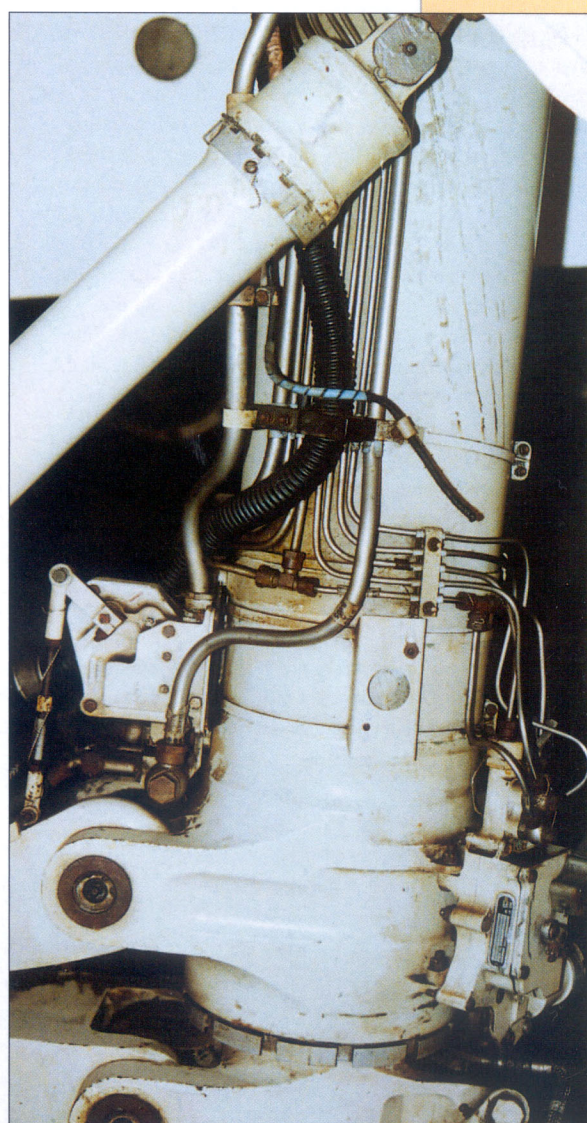
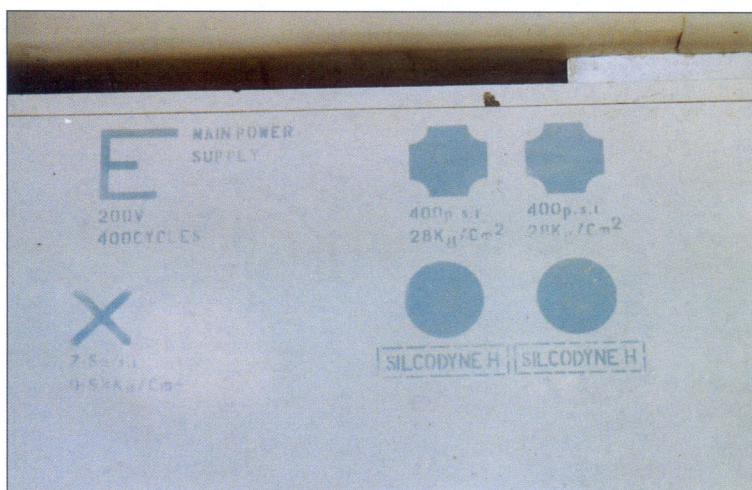
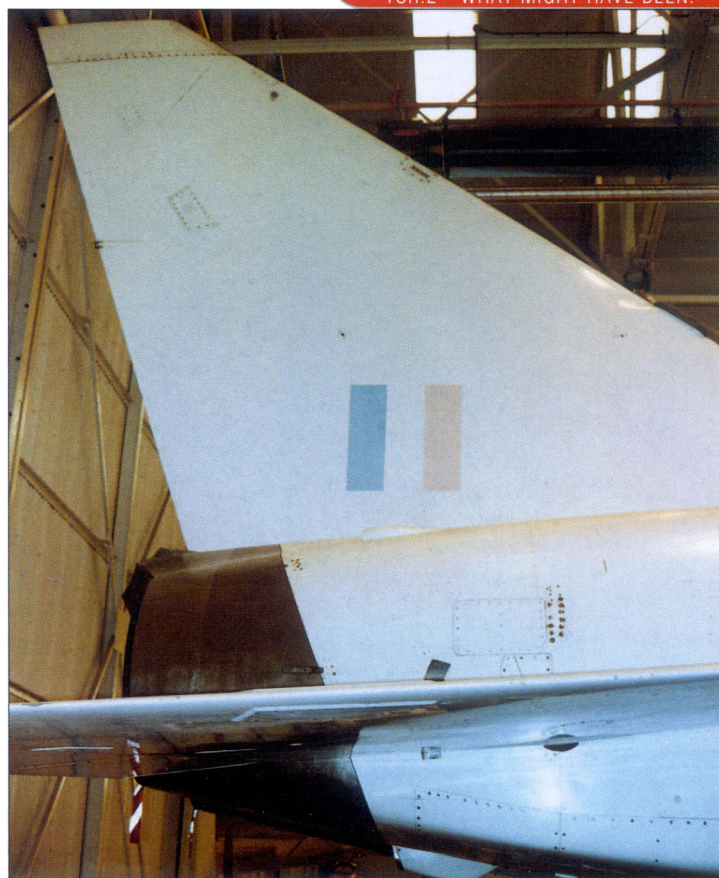
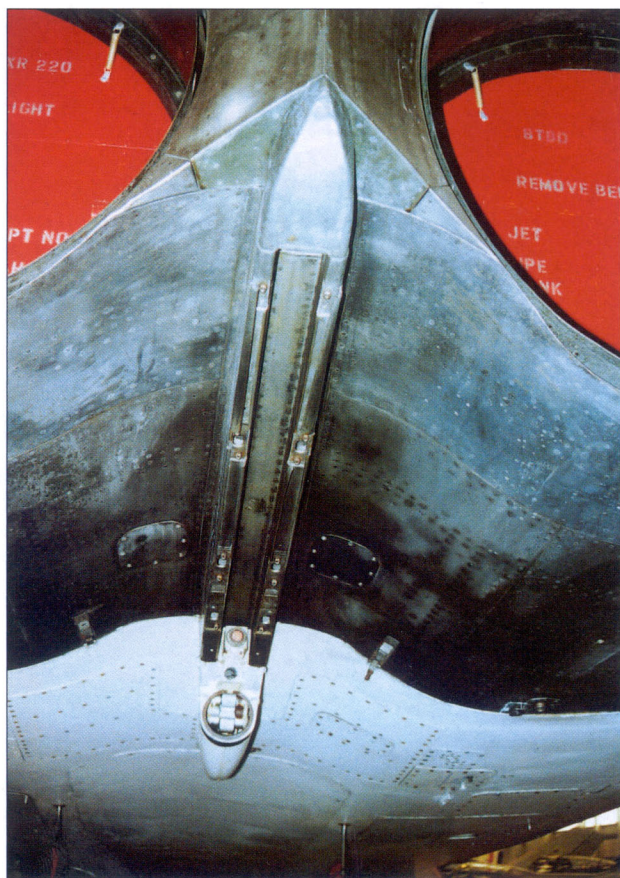
On long sorties the navigator was to obtain an independent fix every 180km or so over well-mapped terrain. The SLAR was to be used for this. The final portion of the nav/attack system was a

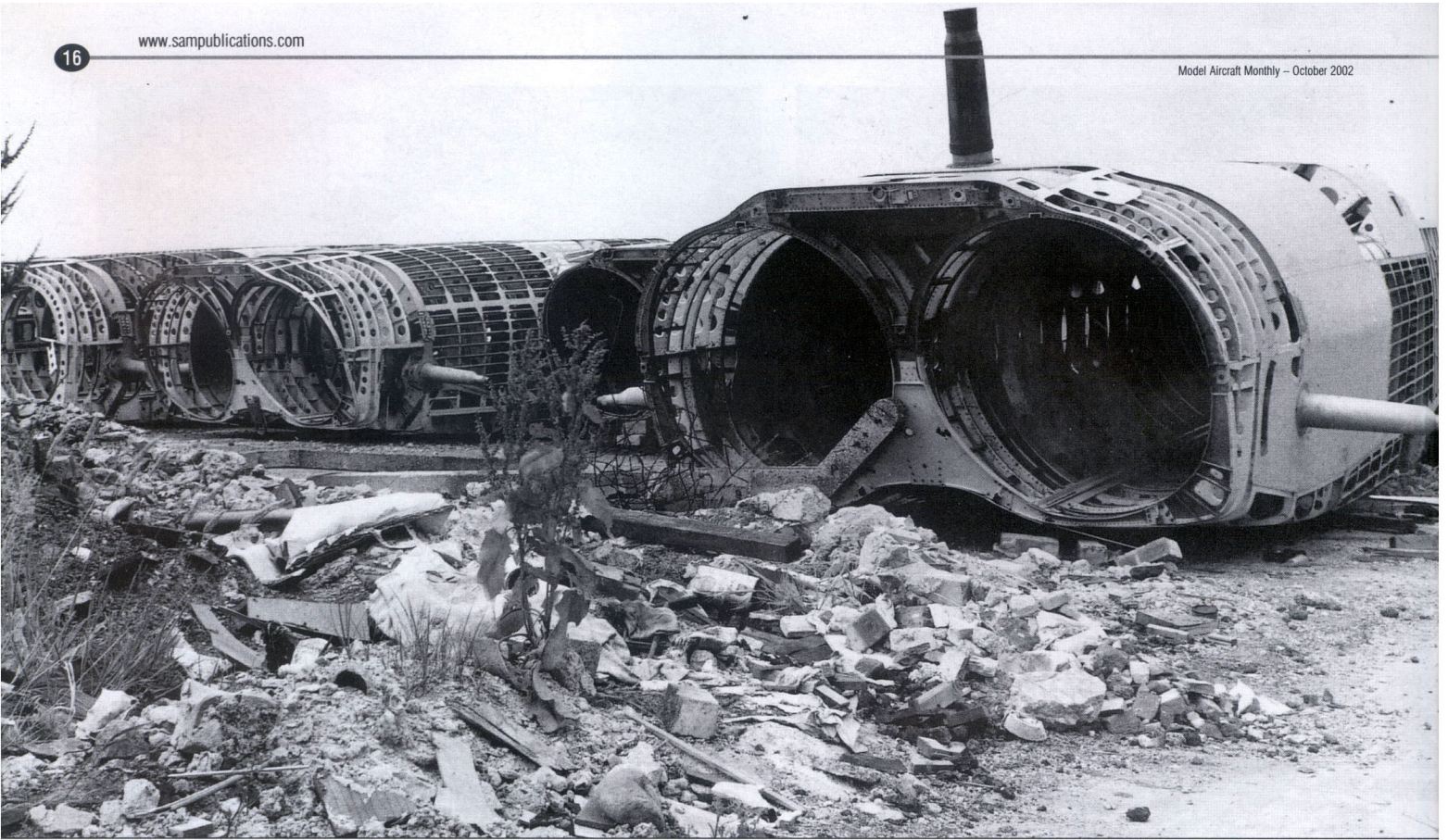
Ferranti monopulse terrain-following radar, which would allow the aircraft to maintain an altitude of 60m. For the reconnaissance role, a pallet could be installed in the bomb bay. This contained a Q-band, sideways-looking, radar active optical linescan and three FX.126 cameras. In addition, one forward and two sideways-looking F95 cameras were permanently fitted in the aircraft's nose. The SLAR provided continuous coverage up to 18km either side of the aircraft's track. Linescan could be used by day or night, and its data was intended to be transmitted directly to a ground station by radio.

Manufacturer

The first TSR.2, XR219 was rolled out at Weybridge on 4th March 1964 and taken to Boscombe Down by road for final assembly. The first flight was repeatedly delayed, mainly due to problems with the Olympus engines. When the engines were first offered up to the prototype they literally would not fit in the fuselage because of changes to various accessories which did not tally with the airframe drawings. Further modifications were needed to get even the minimum clearance. There was pressure to have TSR.2 ready to fly at the SBAC Farnborough show in early September 1964, but XR219's first flight was not made until September 27th (call sign Tarnish 1), with Roland Beamont at the controls and Don Bowen in the back seat. For this flight, the undercarriage was left extended and the engine intake configuration fixed. Beamont found that the TSR.2 was pleasant to fly, without any major deficiencies. The flight lasted for 27 minutes. The second flight was not made until the end of December, because the engines had to be replaced. During the second and third flights there was significant engine-related vibration. The undercarriage was also troublesome. On the fifth flight it suffered a serious malfunction and Beamont considered ejecting, but in the end he elected to attempt to land the aircraft, which he did, although the undercarriage was stuck in the wrong







position. It was not until the tenth flight on February 6th 1965 that a successful undercarriage retraction was achieved.

On February 22nd 1965 Beamont lifted XR219 from the Boscombe runway for the 14th time, with Peter Moneypenney in the back seat, and proceeded to bring the aircraft home to Warton, flying at supersonic speed (Mach 1.12) through bumpy air. XR219 achieved this with only the No.1 engine at one-third reheat. The full performance envelope could not be investigated during this flight, because of a problem in the No.2 engine, which prevented the selection of the reheat. XR219 remained completely controllable, with only a small trim change required. It is interesting to note that Jimmy Dell, who was flying the chase Lightning, was unable to keep up. This was the only time that XR219 flew supersonically. While everything was fine on the aerodynamics side, there were numerous teething troubles with other elements of the TSR.2. The undercarriage continued to cause problems, with serious (1.5g) oscillations on touch-down. The cabin air conditioning failed to operate in any reasonable way and the engines were a source of constant problems.

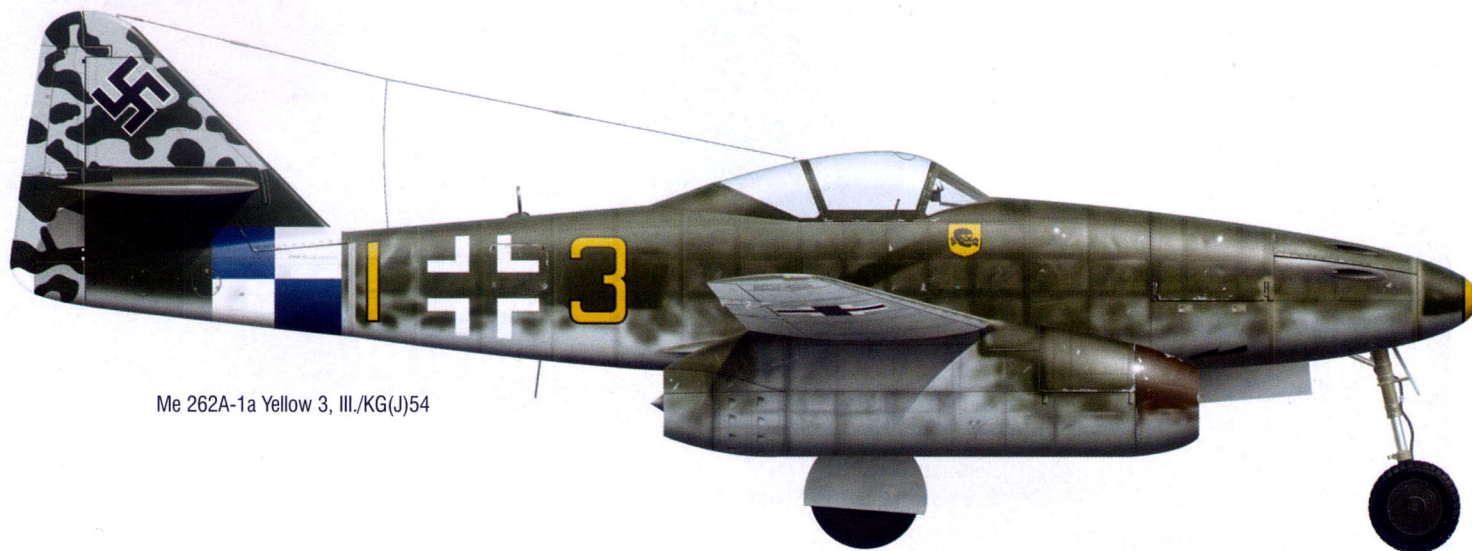
After the cancellation, on April 6th 1965, the three TSR.2s that had been built were immediately grounded (XR220 had been scheduled to make its maiden flight the same day). XR219 had flown 24 missions, totalling 13 hours and 9 minutes. At this point 49 aircraft were in various stages of production. These comprised the remaining eight development aircraft, eleven pre-production machines and the first 30 for squadron service.

- XR219 was trucked to the gunnery range at Shoeburyness.
- XR220 was kept at Boscombe for a year or so and then placed in storage at RAF Henlow after it had had all internal equipment ripped out (even the wires to equipment were cut rather than disconnected). It is now at the RAF Museum Cosford near Wolverhampton.
- XR221 and XR223 were sent to Shoeburyness.
- XR222 is in the Imperial War Museum at Duxford.
- XR223 was also trucked to the gunnery range at Shoeburyness.
- XR224, XR225, XR226 and XR227 were scrapped.
- All tooling was destroyed. On the production line, as workers completed assembly of some airframes prior to their transport to the scrap yard, the tooling was being destroyed with cutting torches behind them.
- A wooden mockup of the TSR.2 was dragged out of the Warton factory and burned while the workers looked on.

All technical publications were ordered to be destroyed; even photographs of the aircraft were destroyed. Boscombe Down's official records of test flights were 'lost'. In many ways the destruction of every aspect of the actual hardware reflected the even greater act of vandalism that had been perpetrated on the British aviation industry.

Roland Beamont, who knew the TSR.2 better than anyone, believed that it was 'one of the most remarkable designs in aviation history', and, like so many, others regarded its demise as a very great loss to the RAF. **MAM**





Me 262A-1a Yellow 3, III./KG(J)54

Checkers Anyone?

LUFTWAFFE CHECKERBAND UNITS

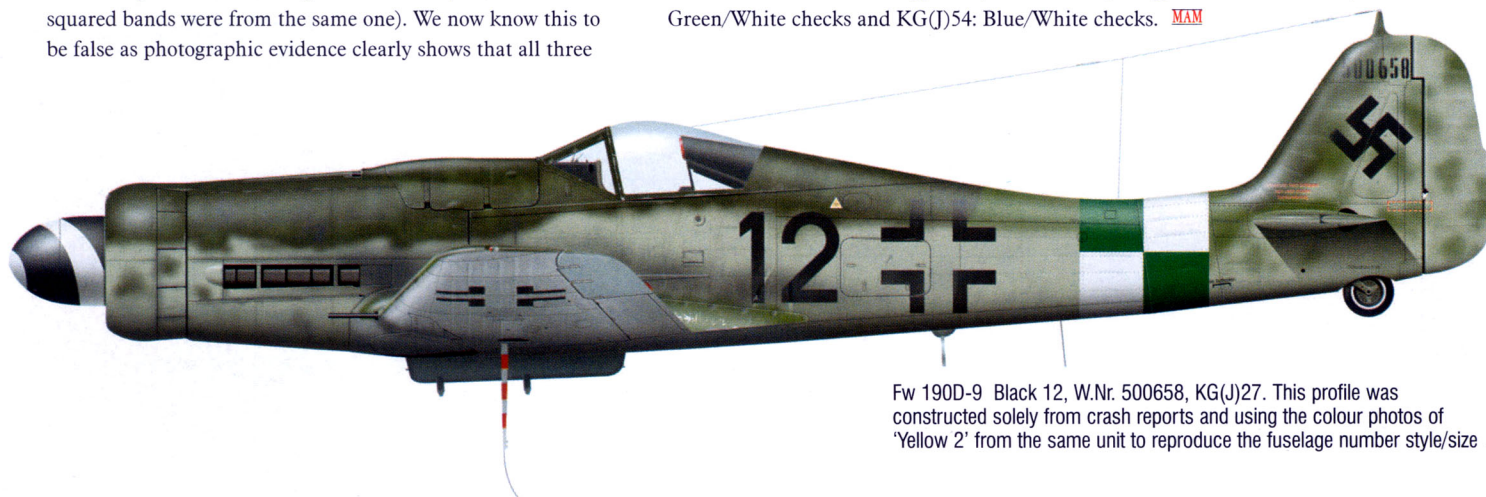
by Thomas A. Tullis

Luftwaffe fighters assigned to Reich defence (Reichsverteidigung, abbreviated as RV) duties were required to wear a coloured band on the aft fuselage for air-to-air identification. The first use of this marking was by JG1 with a simple red band in 1943. In February of 1945 the RLM issued an order specifying exact colour combinations for each RV unit and detailed specific dimensions for single, double and triple coloured bands. Unfortunately, this order did not mention the most interesting of all RV band styles, the checkerboard. This type of band was used to identify the KG(J) units that were switched from bombing to defensive duties. Up to this point, the RV bands had all consisted of single, double, or triple vertical stripes on the aft fuselages of the fighters assigned to these units. With the conversion of the KG(J) units, the checkered style band began to appear. A number of theories have been put forth regarding these markings, some of them accurate, some not. One idea was that the style of checker designated the unit (i.e. all four-squared bands were from the same one). We now know this to be false as photographic evidence clearly shows that all three

known units used four-squared bands, and two of them used the ten-square version.

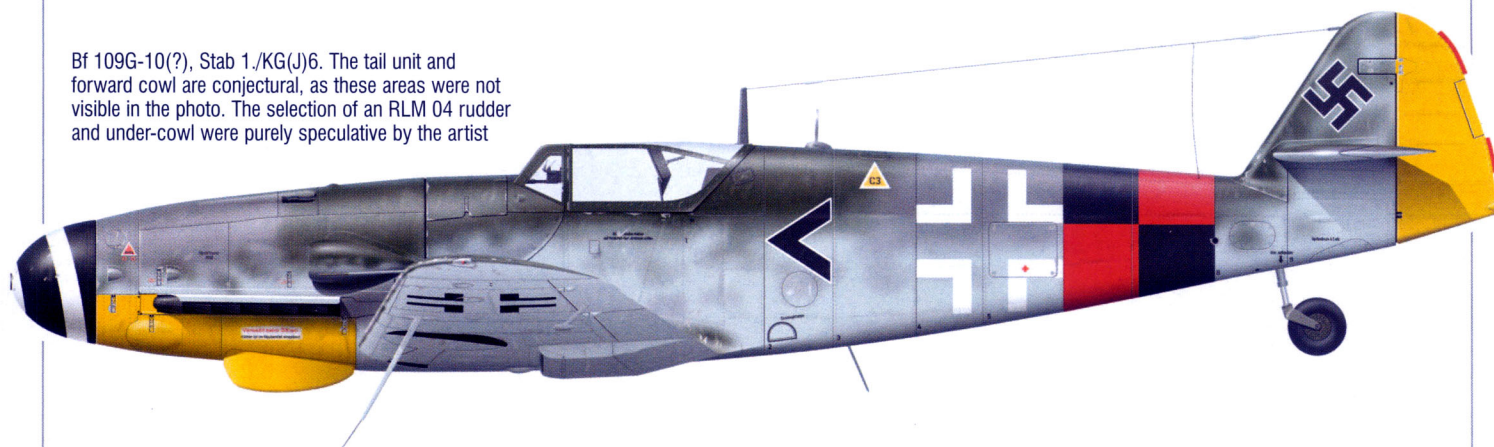
Initially, these bands consisted of ten small squares in two rows of five. Later, the switch was made to a larger, four-squared band. While no information has been found explaining why this change was made, it is my belief that the reason is quite obvious. Upon observing a model of an Me 262 with the ten-squared band at a distance, it became apparent that the small checks began to blend beyond a certain point and could not be clearly identified. As these were recognition markings, positive identification at a distance was a must. It would seem logical that if the 10-squared band did not accomplish this, then a larger version of the marking would have to be employed.

To date, three-colour combinations of bands have been identified. While each one of these shares the same base colour as its sister JG unit's band, it is unknown if this was by design or accident. These are: KG(J)6: Red/Black checks, KG(J)27: Green/White checks and KG(J)54: Blue/White checks. **MAM**



Fw 190D-9 Black 12, W.Nr. 500658, KG(J)27. This profile was constructed solely from crash reports and using the colour photos of 'Yellow 2' from the same unit to reproduce the fuselage number style/size.

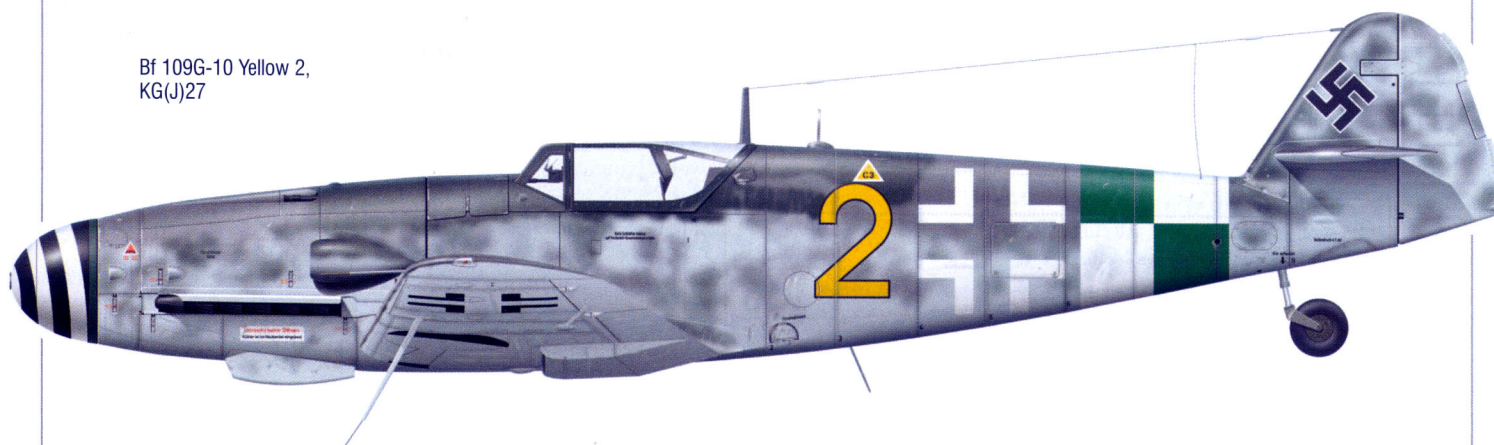
Bf 109G-10(?), Stab 1./KG(J)6. The tail unit and forward cowl are conjectural, as these areas were not visible in the photo. The selection of an RLM 04 rudder and under-cowl were purely speculative by the artist



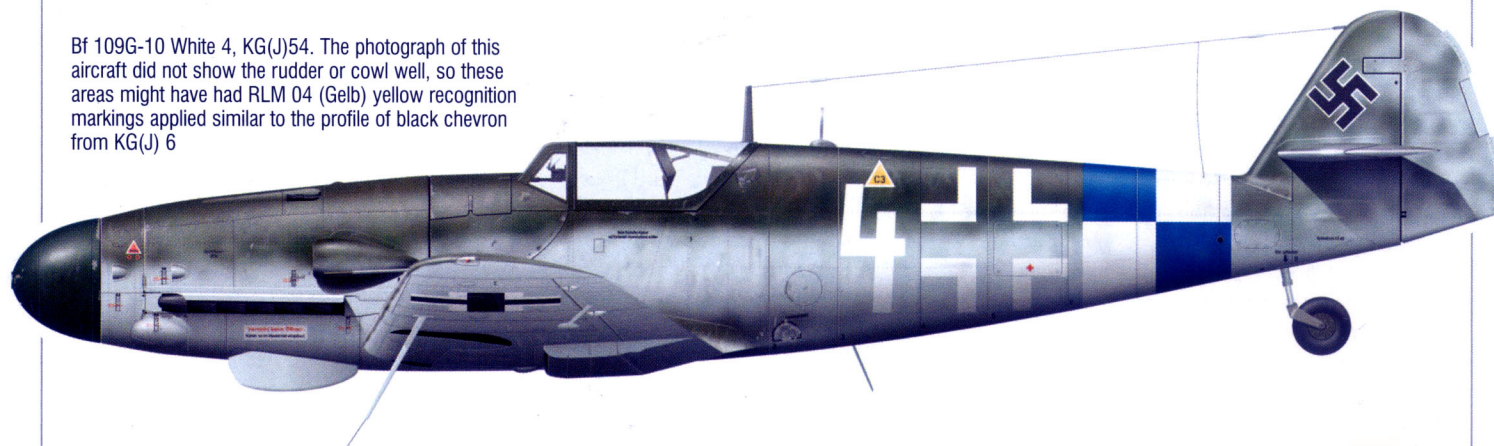
Me 262A-1a Yellow 5, W.Nr.501232, KG(J)6



Bf 109G-10 Yellow 2, KG(J)27



Bf 109G-10 White 4, KG(J)54. The photograph of this aircraft did not show the rudder or cowl well, so these areas might have had RLM 04 (Gelb) yellow recognition markings applied similar to the profile of black chevron from KG(J) 6





BAC Strikemaster
Mk 84 number 301 of
the Republic of
Singapore Air Force

Singapore Strikemaster

by Jim Grant

The BAC 167 Strikemaster Mk 80 series was the ultimate development of the Percival P.84 Jet Provost which made its first flight in June 1954. After being developed through five marks of training aircraft, and the interim Strikemaster Mk 55, the Mk 80 first flew on October 26th, 1967 and immediately attracted a number of orders.

Aircraft were delivered to Saudi Arabian Air Force (Mk 80), South Yemen Peoples Republic Air Force (Mk 81), Sultan of Muscat and Oman's Air Force (Mk 82), Kuwait Air Force (Mk 83) and the Republic of Singapore Air Force (Mk 84) respectively. All were essentially similar.

The major differences between the Strikemaster and Jet Provost T.5 and T.55 are the installation of an uprated Roll-Royce Viper 535, self-sealing tanks and a reinforced wing capable of carrying 1,360kg (3,000lbs) of military equipment. Limited armour protection was fitted for the crew and military equipment was installed. A remarkable range of offensive weapons, reconnaissance and intelligence pods and fuel tanks can be attached to its eight underwing hard points.

The Strikemaster was the first aircraft with an operational capability to be delivered to the Republic of Singapore Air Force and came into service, as part of the Flying Training School, on October 18th, 1969. No 130 (Eagle) Squadron was formed, within the FTS, to operate these aircraft and additional examples of this type were acquired in 1977 from the Sultanate of Oman. The Strikemaster was chosen primarily as an advanced and

weapons trainer, however it was capable of giving a degree of air support and remained in operational service until 1985. Aircraft 301 is on display at the RSAF Museum.

The original insignia applied to these aircraft was a standard red/white/red roundel which appeared between 1968 and 1973. This was subsequently replaced by a red and white yin/yang, a split ball, with red and white streamers at top and bottom. The presentation of this design was later changed to black on a camouflaged background

The camouflage scheme is uncomplicated. The upper surfaces are mid-brown and two shades of green with warm white undersurfaces. The tip tanks are warm white with a very small black tip. At the rear of the fuselage there is a white band with a black trim which runs right round the fuselage. The tailpipe is aluminium. The undercarriage assembly is natural metal. All instructions painted on the airframe are in English and are painted black. Standard red/white ejection seat and yellow/black rescue markings appear on the aircraft. The landing lights are installed in the nose, behind a clear panel which is trimmed in black. **MAM**

Sources

Jane's All the Worlds Aircraft 1984
War Machine No 106

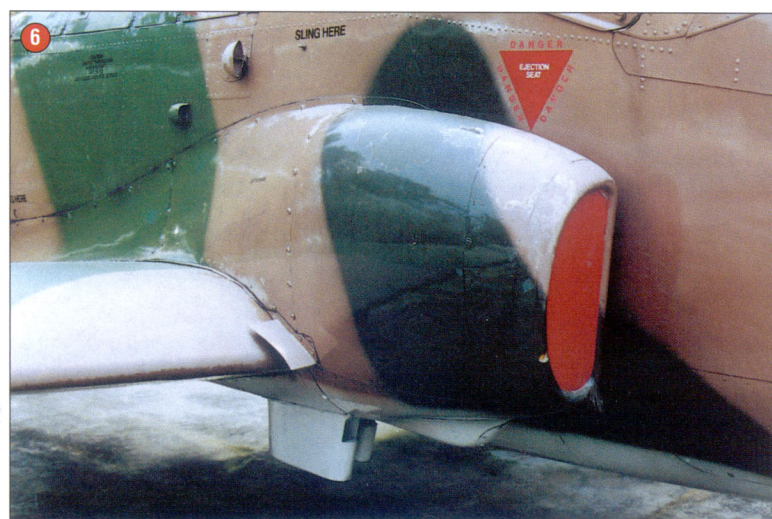
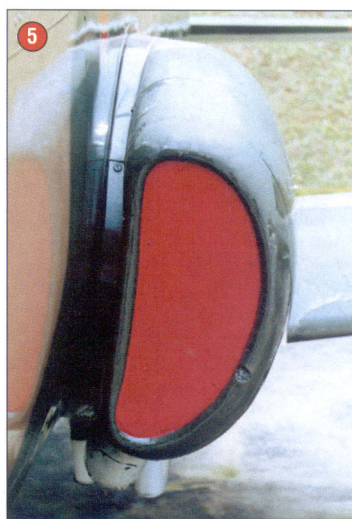
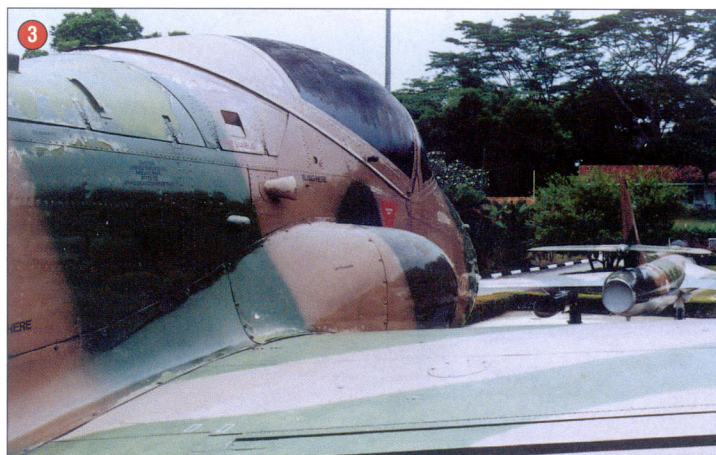
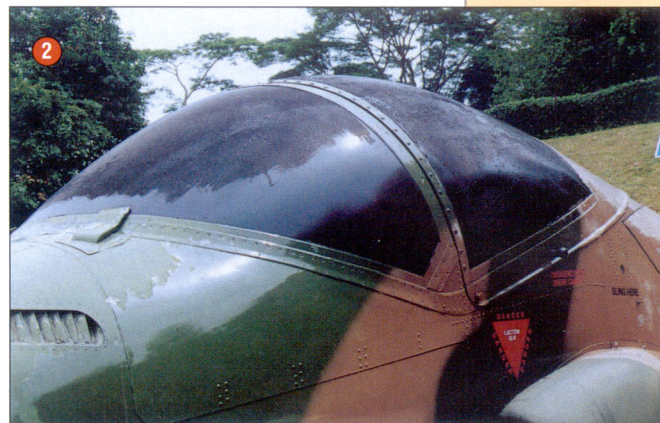
Websites :

(1) History of the RSAF :

http://www.geocities.com/CapeCanaveral/3900/rsaf_hist.html

(2) Ensignia of the RSAF :

<http://www.geocities.com/CapeCanaveral/3900/insignia.html>



1. Nose section, landing and navigation lights

2. Port side cockpit canopy

3. Looking over the starboard wing to the engine air intake and cockpit

4. Looking over the port wing to the engine air intake and forward fuselage

5. Port side engine air intake

6. Starboard engine air intake, showing three-colour camouflage scheme

7. Starboard rear fuselage. Note original RSAF roundel

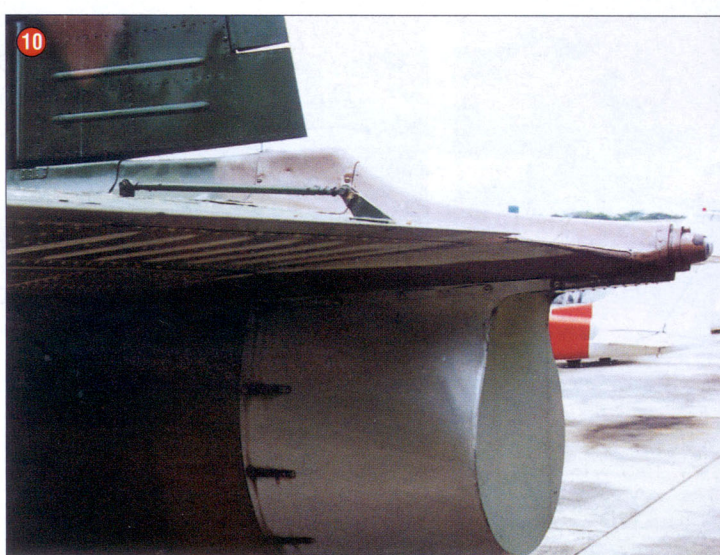


8. Port side rear fuselage



9. Fin and rudder

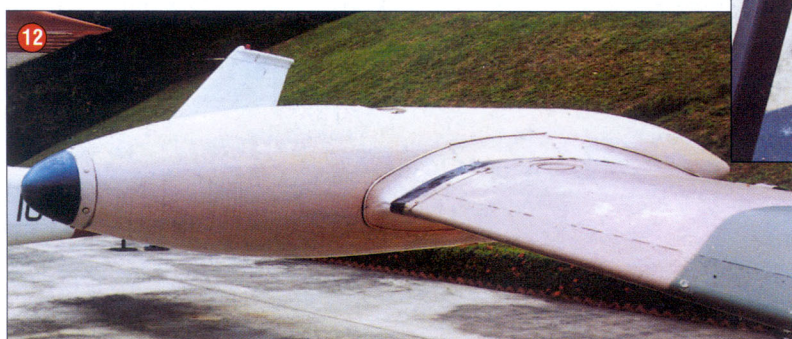
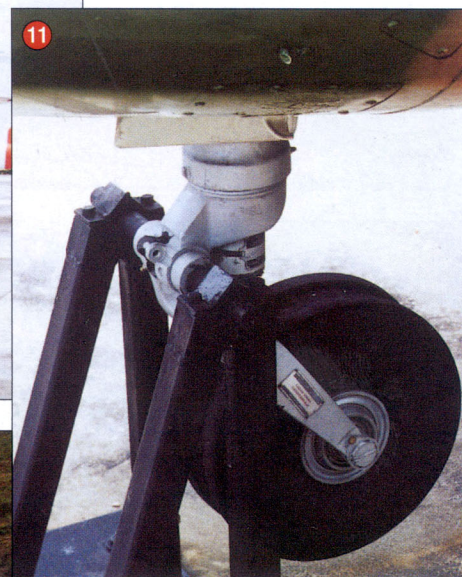
10. The tailpipe and tailplane



11. Nosewheel assembly

12. Starboard wing tip fuel tank

13. Port wing and wing tip fuel tank





14. Starboard undercarriage assembly

15. Starboard access panels behind cockpit

16. Port side access panels behind cockpit

17. Starboard auxiliary air intakes

18. Electrical area access panels



French Tucanos

by J. B. E. Hale

One of the most successful basic flying training aircraft of recent years has been the Embraer EMB-312 Tucano. Designed and built in Brazil, this aircraft has won export orders all over the world. Despite its third-world origins, the Tucano even secured a place in the inventory of two air forces of NATO member countries, serving with both the Royal Air Force and the Armée de l'Air.

Built as a basic trainer for the Brazilian Air Force to replace the Cessna T-37C, the Tucano was designed during 1978 by a team led by Joseph Kovacs and the prototype first flew in August 1980. Export orders were received as early as 1983, when Egypt decided to purchase 134 Tucanos to fulfil its basic training requirement; a licence-production agreement was secured, and many aircraft from this order were transferred to Iraq. Orders then followed thick and fast from air forces throughout the world. As may reasonably have been expected, the aircraft achieved great export success in its home continent of South America, Tucanos now serving with the air forces of Argentina, Honduras, Colombia, Paraguay, Peru and Venezuela; in many of these nations, the aircraft has a subsidiary ground-attack role. In all, over 800 Tucanos have been built. The aircraft was also put forward to fulfil the JPATS requirement for a new primary trainer for the United States Air Force and Navy; unfortunately for Embraer, the bid for this large order was unsuccessful, the Tucano losing out to the Swiss-built Pilatus PC-9, its main competitor in the world marketplace.

Magister

The success achieved by Embraer in persuading the Royal Air Force to adopt the Tucano when it was seeking to replace its elderly Jet Provost trainers in 1985 enhanced its prospects for further orders from Europe considerably. France similarly had a requirement for a new basic trainer to replace an elderly jet,

in this case the Fouga CM.170 Magister. Thus, in a decision similar to that made by the neighbouring RAF, the Armée de l'Air also decided to replace a turbojet-powered aircraft in favour of an aircraft with a modern turboprop powerplant. To the delight of the bean-counters, the new generation of turb-prop trainers such as the Tucano and Pilatus PC-9 could deliver a performance and training value approaching that of the earlier generation of jet-powered trainers, but with a substantially lower operating cost.

France's order was placed in July 1990; initially, an order for 80 aircraft was envisaged. Unlike the RAF, who demanded radical alterations to the aircraft to enhance performance at low-level and also insisted on licence-production for its order of 130 Tucanos, the French were content to order the aircraft from the designers in its original form. A few modifications were required, however, including an increased airframe fatigue life and a ventral airbrake; French avionics were also to be installed. Accordingly, this variant of the Tucano was designated as the EMB-312F.

Two pre-series aircraft were ordered, first flying in April 1993. The manufacturer took the opportunity to display these aircraft at the Paris Air Show that year, prior to delivery to the customer. After a year-long evaluation period by the CEV (Centre d'Essais en Vol, the French testing centre) at Mont de Marsan, an order for 48 Tucanos was eventually confirmed, with deliveries commencing in 1995. It had originally been intended to re-equip the various Base Flights, which also flew the elderly Fouga Magister, but shrinking defence budgets ruled out this luxury and the proposed follow-on order for 30 additional Tucanos never materialised.

The School of the Air

The Tucano is flown by Groupement d'Instruction 312, one of the flying units of 'L'Ecole de l'Air', based at Salon de

A Tucano T.1 of 1 FTS touches down on Linton's runway, whilst an EMB-312F waits its turn to line up. The Shorts-built Tucanos were fitted with a four-bladed propeller, because the Allied-Signal TPE331-12B turboprop engine installed in the Tucano T.1 produces more power than can comfortably be absorbed by the three-bladed propeller fitted to the original Embraer aircraft, which was powered by the PWC PT6A-25C. The RAF insisted on the change of engine to enhance performance

All photographs © the author



1. The EMB-312F is able to carry two ferry tanks of 330 litres capacity

2. The badge of GI 312, carried on the fin of all four Tucanos seen during our visit

3. A Tucano of GI 312 lines up on Linton's runway. Compare the forward fuselage with the previous photograph of an RAF Tucano T.1: the different arrangement of the jet-pipes is noticeable





Provence in the South of France. Lest it be thought that this is a newly-created unit with a designation intended to reflect its equipment, GI 312 had been in existence for many years before the Tucano was even thought of; it is merely a coincidence that they fly the EMB-312! Upon successful completion of the course, aspiring fighter pilots conduct the next stage of their training on the Alpha Jet at Groupement Ecole 314, based at Tours.

British enthusiasts have been given a few opportunities during recent years to view the Gallic cousins of the more familiar Shorts-built Tucano T.1 trainers. GI 312 has an exchange programme with the RAF's principal user of the Tucano T.1, No.1 Flying Training School, based at RAF Linton-on-Ouse in Yorkshire, and four of GI 312's EMB-312F Tucanos and a party of instructors regularly cross the English Channel to make a liaison visit. I was privileged to visit RAF Linton-on-Ouse in June 1998 during one of these exchanges, where the accompanying photographs were taken. In the past these visits were sometimes extended to include a stop-over at

the annual SSAFA Air Display at Woodford in Cheshire; alas, that airshow is now defunct. In 1999, a pair of GI 312's Tucanos visited the Royal International Air Tattoo at Fairford, where they were on display to a much wider audience of modellers and spotters.

The Tucano may not be the most inspiring aircraft in the world to model, but it certainly has a place amongst any representative collection of modern military aircraft. The Tucano has received scant attention by the major kit manufacturers, and the writer cannot vouch for the existence of a kit depicting the EMB-312F in any scale. However, there is at least one 1/72nd scale kit in existence representing the original EMB-312, made by Premier, whilst Airfix produced a model of the RAF's own licence-built Shorts Tucano T.1. Finishing a 1/72nd scale model in GI 312's colours was made easier by Model Art decals, who included markings for one of their aircraft on Sheet No. 72/021

Thanks are due to Philip Inman, Community Relations Officer RAF Linton-on-Ouse [MAM](#)

Tucano '500' was the only Tucano seen during my visit carrying ferry tanks. The frameless canopy of the EMB-312F is readily visible in this view. The RAF insisted on a strengthened canopy for their Tucano variant, to provide greater crew protection against bird-strikes during low-level training flights



A pair of GI 312's Tucanos head for home after appearing in the static park at the 1999 Royal International Air Tattoo



1. The massive flaps are clearly visible in this shot

2. Close-up of the starboard side of the nose

Photo Album

JUNKERS JU 52

by Fraser Gray

The subject of this feature is the Junkers Ju 52 operated by Lufthansa (D-CDLH) in the markings of D-AQUI. This airframe was built in 1936, but nowadays it is powered by Pratt & Whitney engines **MAM**



© All photographs by Fraser Gray



3. A wider view of the starboard side

4. 'D-AQUI' in flight

5 & 6. A clear look at the port side



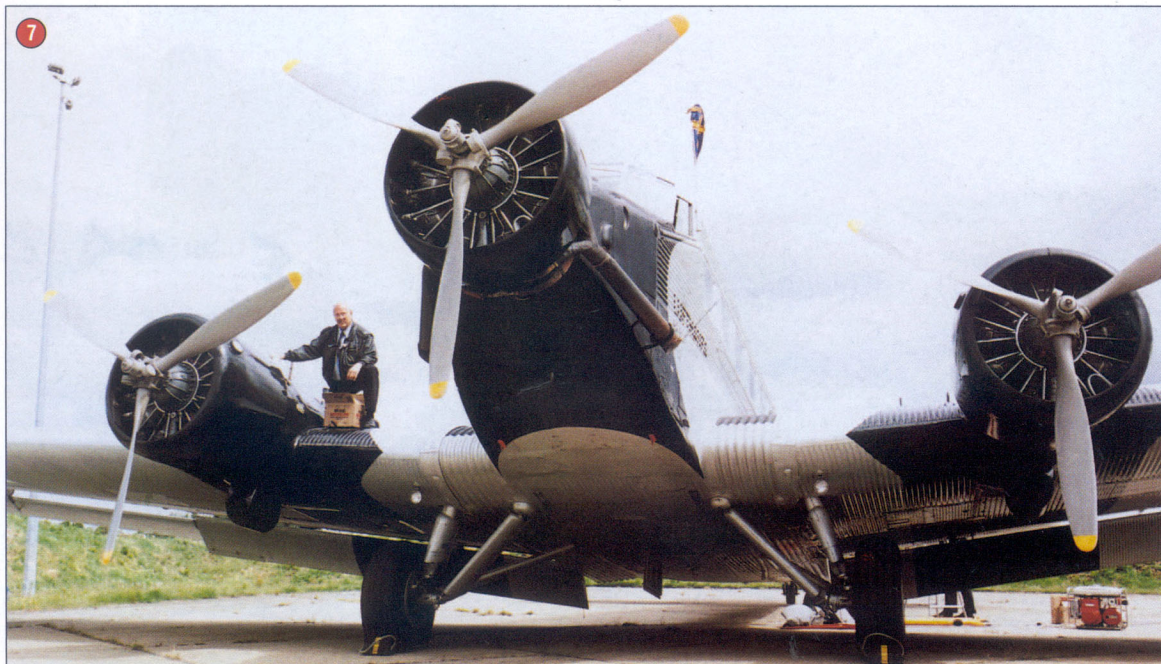
7. Overall view of the nose, clearly showing the 'splayed' outer engines

8. The starboard side viewed from behind

9. The engine cowlings and wheel hubs are not genuine WWII-vintage

10. Close-up of the port side

11. A wider view of the port side of the aircraft





12. This view of the port side shows the window style and the prominent 'corrugated' skinning

13. Close-up of the 'Lufthansa' and 'Berlin Tempelhof' legends on the port side

14. Close-up of the cockpit canopy

15. The cockpit area viewed from the starboard side

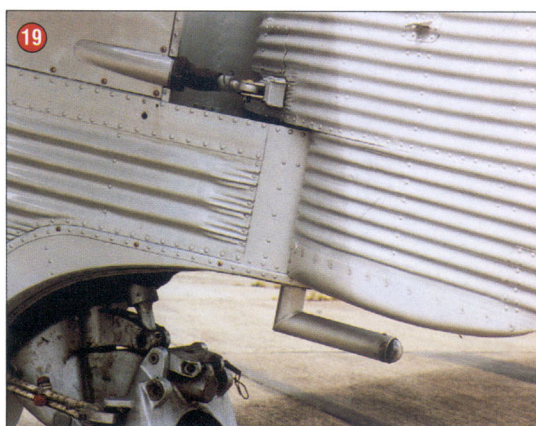
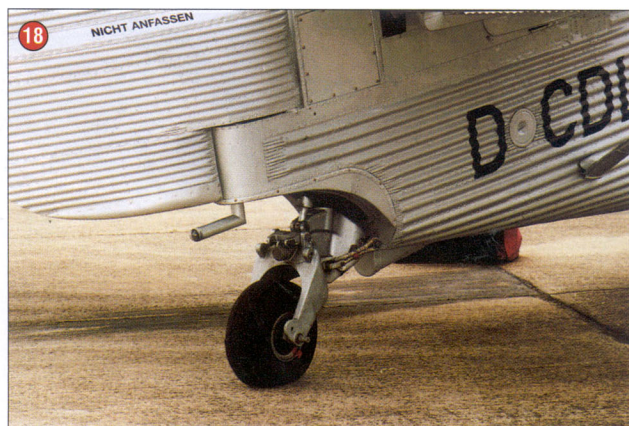


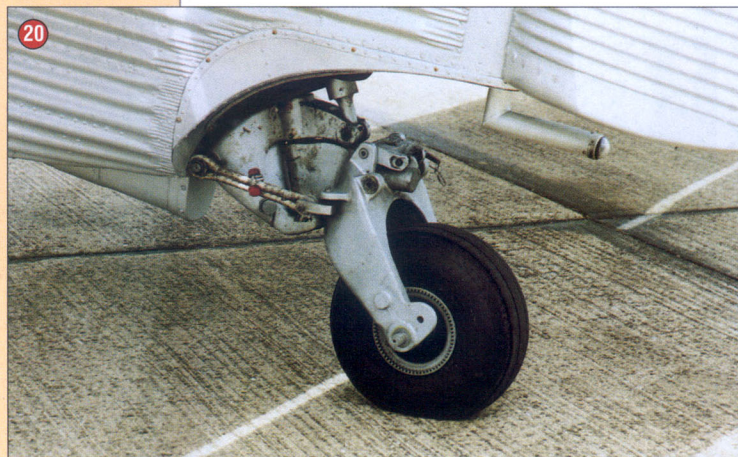
16. The loading door on the port side. This is the single door style; WWII era machines usually had twin doors

17. Close-up of the vertical fin, rudder and tailplane

18. Close-up of the castoring tailwheel

19. The base of the rudder. Note the 'gangly' formation light!





20. A closer look at the tailwheel

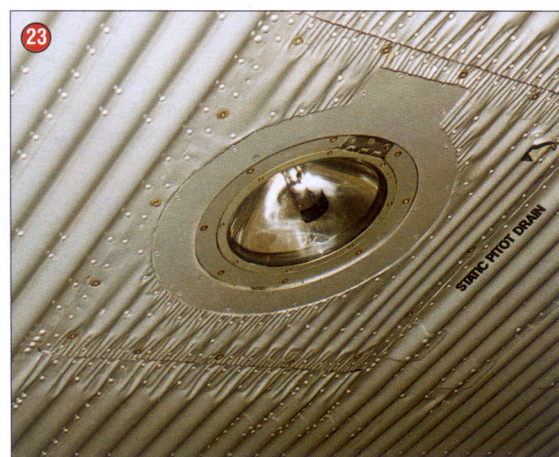
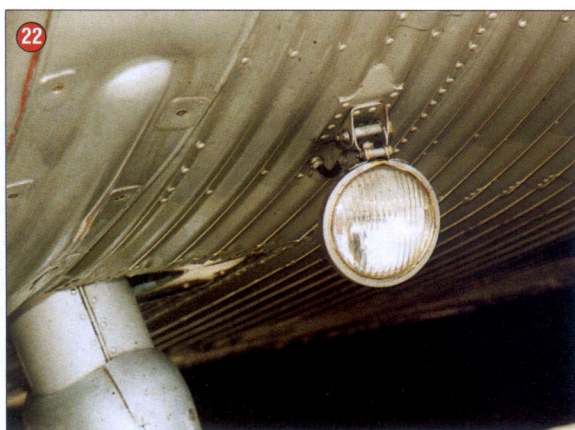
21. The hinges on the rudder look very fragile! Note the formation light added to the top of the fin. This is a modern requirement (like the one below the rudder - See Photo 20)

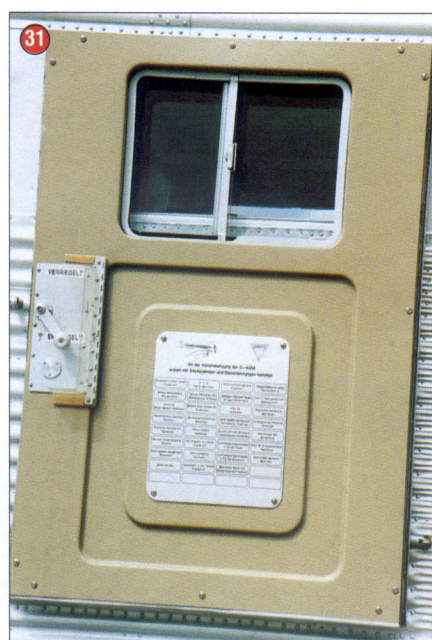
22. Landing light situated forward of the undercarriage

23. The landing light under the mainplane. This unit hinges downward when required

24 & 25. One of the many actuator arms for the flaps. Note the canvas collar protecting the arm from the elements

26. A closer look at the wing





27. The hinge section between the inner and outer flap sections

28. The access door. The grab rail is a modern addition

29. This view of the upper wing section of the port wing clearly shows the 'white' exhaust stains in this area

30. The plaque fitted to this aircraft commemorating all the firms that are involved with its restoration and operation

31. This wider view shows you where the plaque is situated

32. Close-up of one of the main wheels.

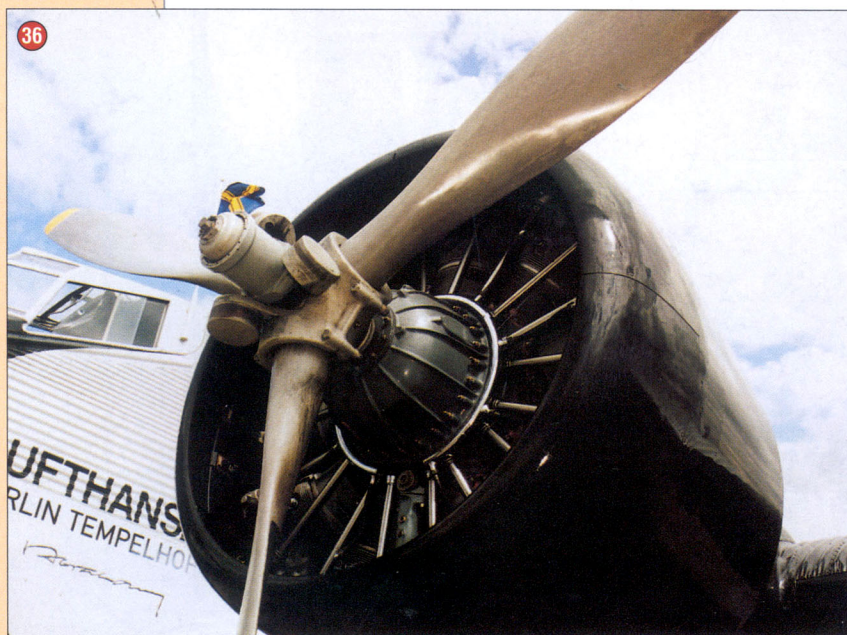
33. A wider view of the main wheel. The hub is a post-war style, as are the tyres

34. The Ju 52 certainly 'sits' on its undercarriage!

35. View of the main wheel with its modern hub

36. Close-up of the port engine and cowling

37 & 38. In these shots you can see the exhaust stacks and the oil cooler





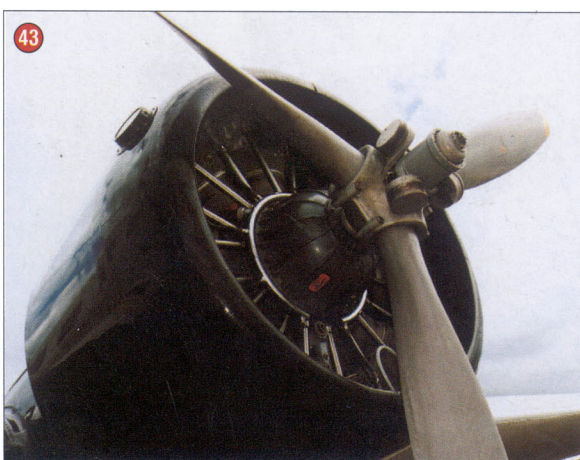
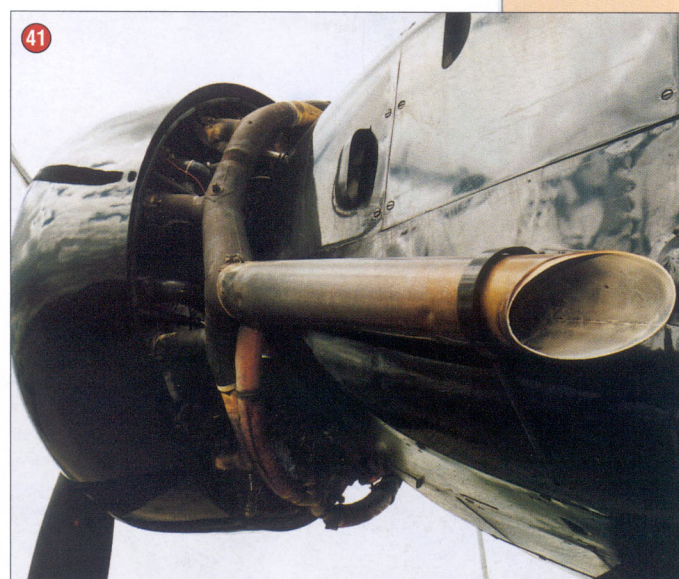
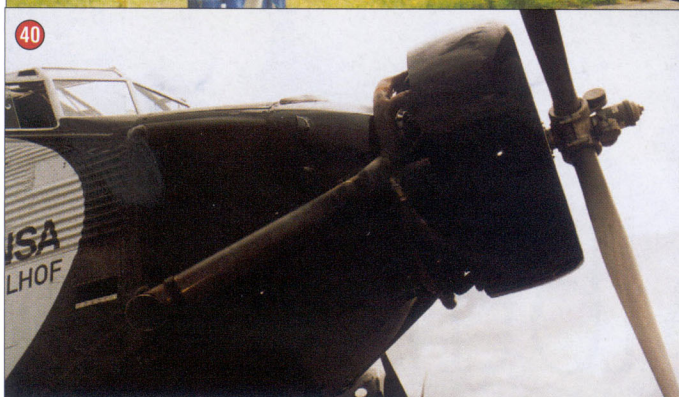
39. Overall view of the starboard engine. Note the gauge mounted on the inner face of the cowling

40 & 41. Two views of the exhaust stacks for the front engine

42. The oil cooler under the wing

43. Note the counterweights on the propeller hub

44. Viewed from the back, you can see the exhaust and the pipework for the oil supply





1. The subject of this feature is the F3F-2 at the Museum of Naval Aviation, Pensacola.

2. Overall port side view

Photo Album

GRUMMAN F3F by Bill Coffman





3. The starboard side of the machine

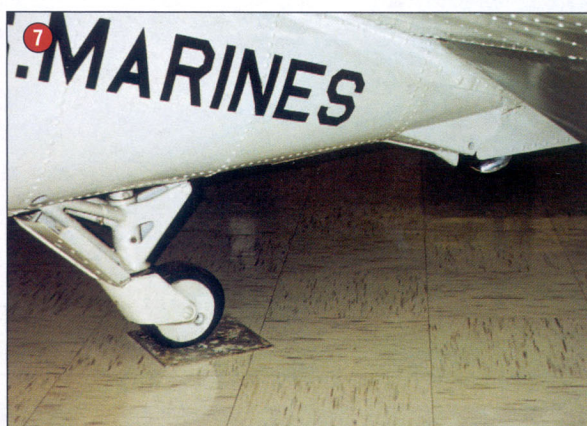
4. Another view of the port side

5. This view from the starboard rear of the machine clearly shows the angles of the struts

6. Close-up of the vertical fin and rudder

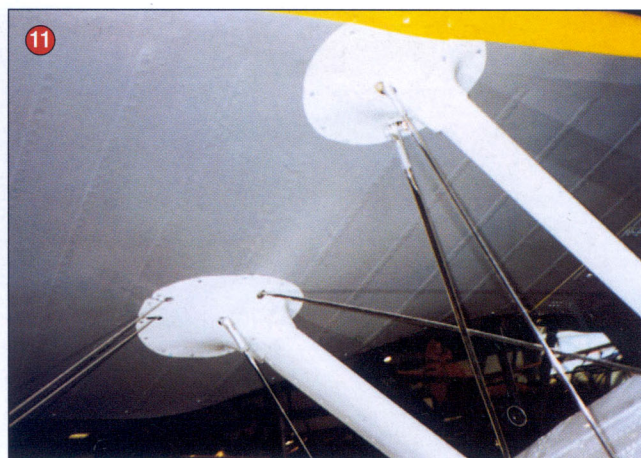
7. The tailwheel assembly features a solid rubber tyre, something that is quite common with carrier aircraft

8 & 9. Overall views of the tail section





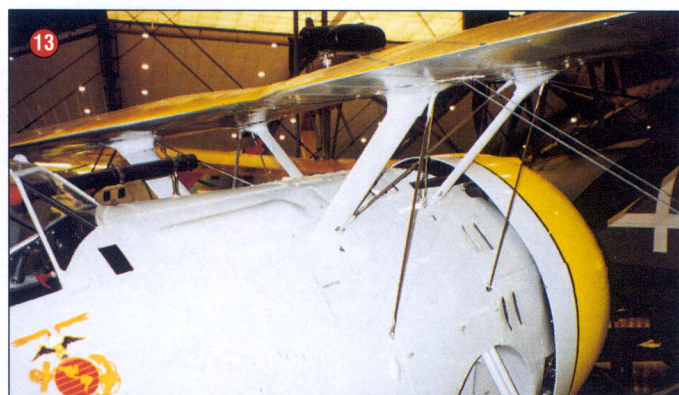
10. Cabane struts under the wing centre section



11. This is a look at the top of the cabane struts as they meet the upper wing panel. Note the flight wire attachment points



12. This is the top of the outer wing struts. Note the lack of any 'bases' to these and the fact that the flight wires actually enter the wing



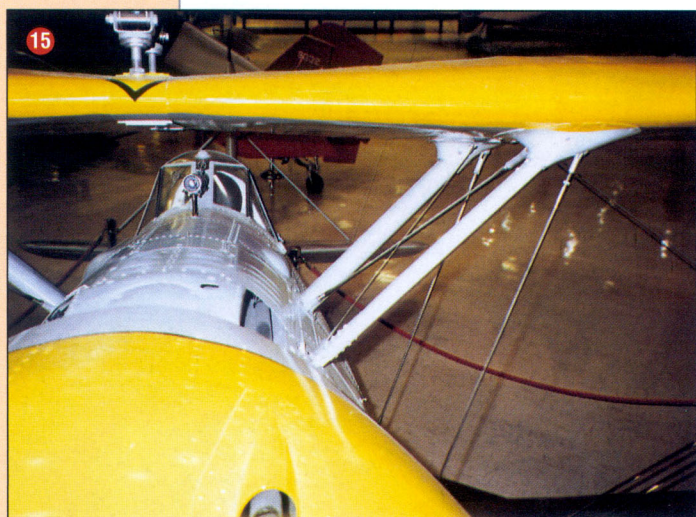
13. Overall view of the fuselage forward section (starboard side). The limited number of flight wires is evident

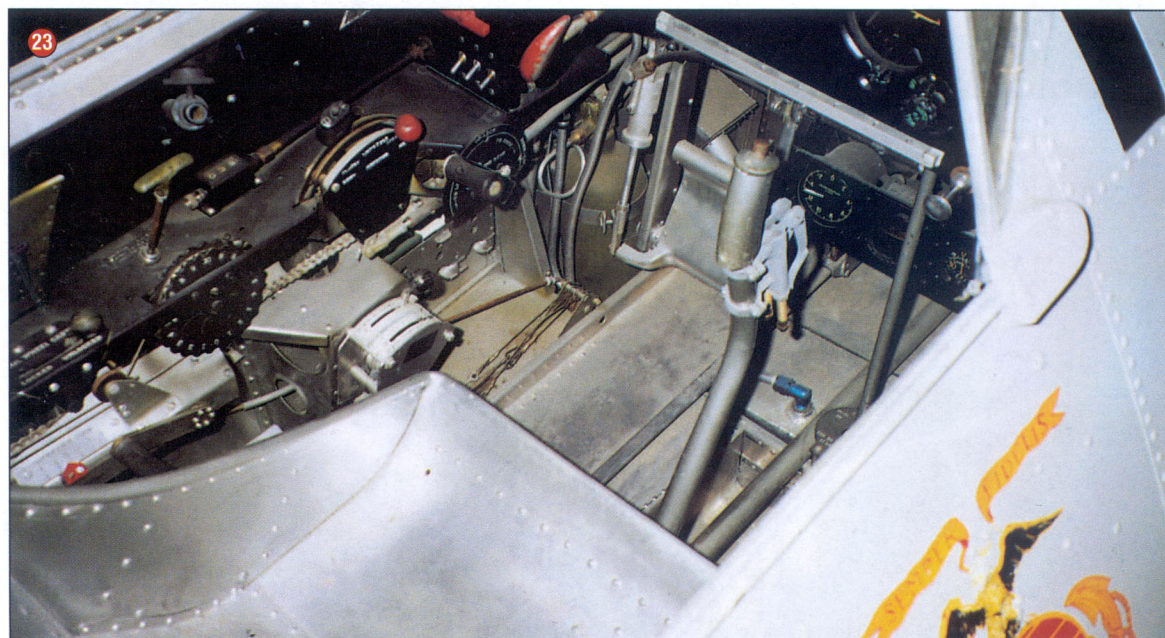
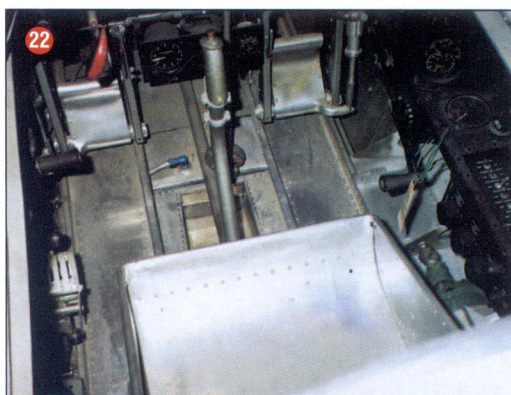
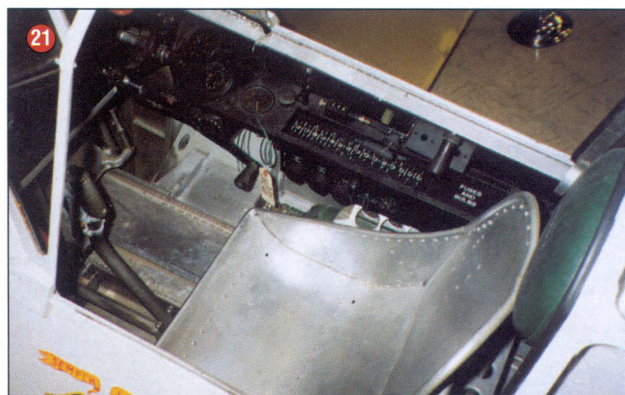
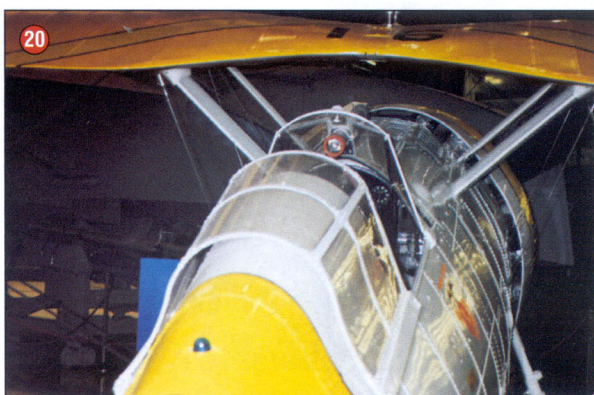
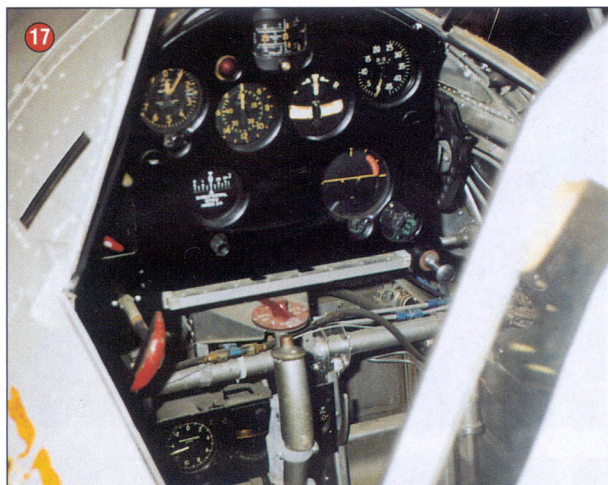


14. A good look down the fuselage under the wing centre section. Note the gun camera mounted on top of the wing

15. A shot looking straight towards the cockpit

16. A useful overview of the mid section and cockpit. Note the Aldis-style gunsight





17. A quick look into the cockpit area

18. This shot shows the extent to which the canopy opens. Note the viewing panels forward of and below the windscreen

19. Another look at the cockpit canopy

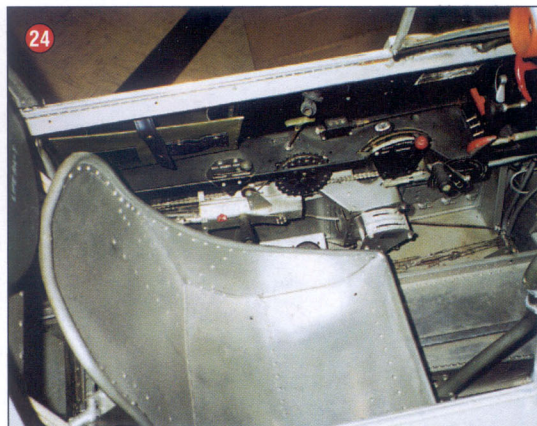
20. A top view of the cockpit. Note the formation light on the dorsal spine

21. The pilot's seat is aluminium and quite plain as shown in this shot

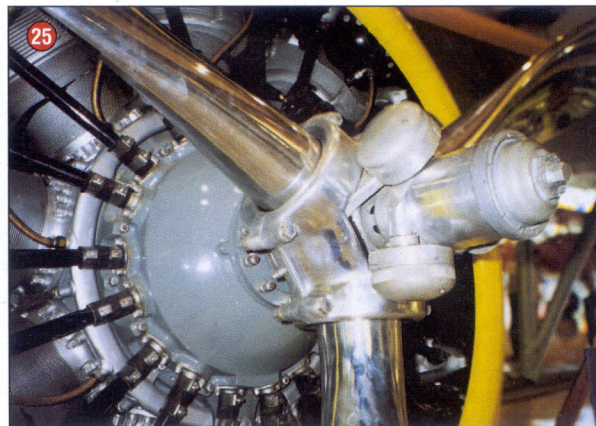
22. The rudder pedals and control column are seen here

23. This shot of the port sidewall clearly shows the console in that area with the throttle quadrant, etc

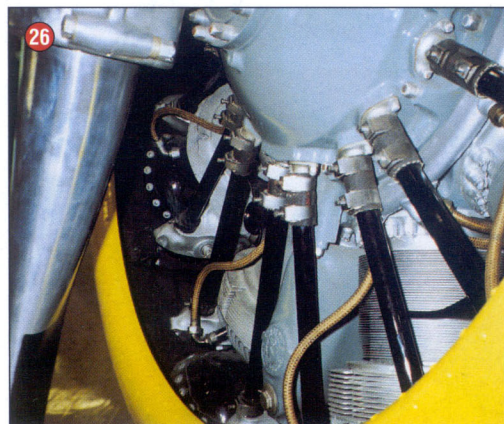
24. A clearer view of the port cockpit sidewall



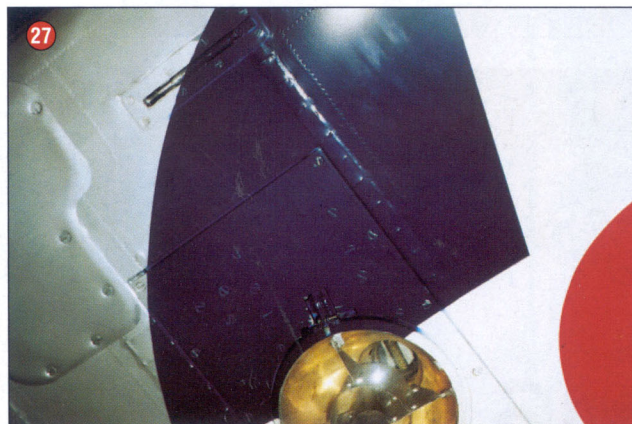
25. Close-up of the propeller boss and counterweights



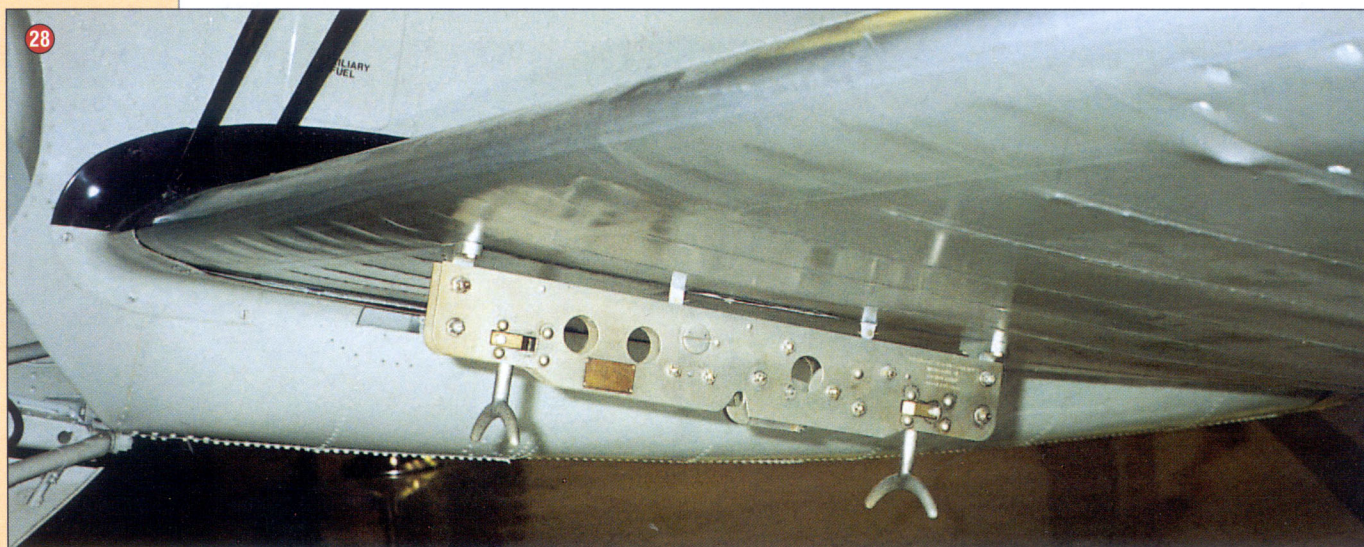
26. This shot shows the engine pushrods and ignition harness



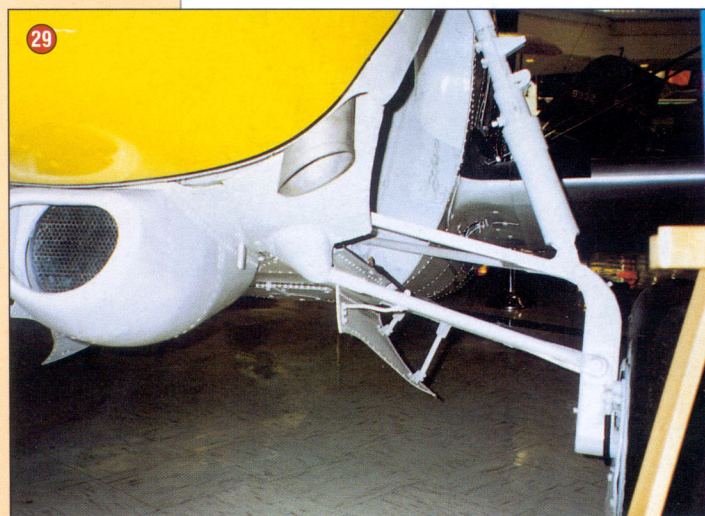
27. This shot of the undersurface of the outer wing panels shows the landing light that is recessed into it



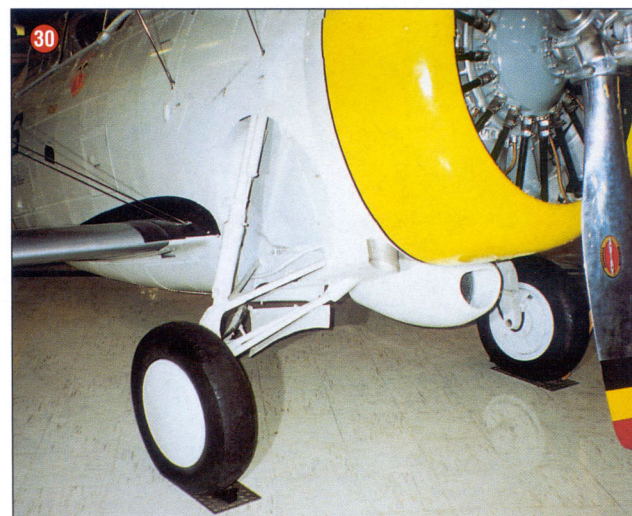
28. The light bomb racks carried under the wings

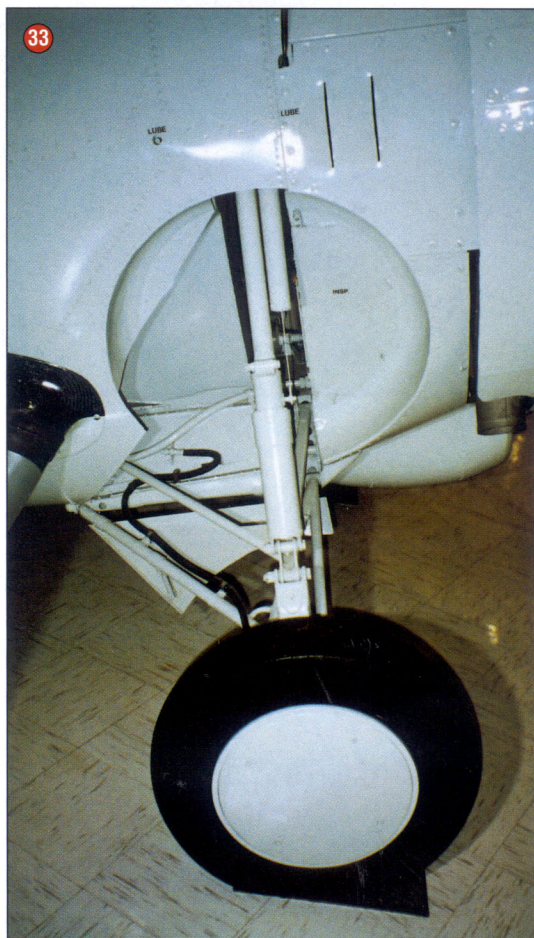


29. In this shot of the typical Grumman style undercarriage you can also see the carburettor intake and exhaust stack



30. An overall shot of the starboard undercarriage assembly





31. Close-up of the starboard undercarriage clearly showing the pipework associated with this unit

32. Overall look at the big radial engine and propeller fitted to the F3F

33. The starboard undercarriage unit

34. A quick look into the well of the port undercarriage

35. This nice clear shot of the back of the main wheel hub clearly shows the hydraulic brake pipe's passage into it

36. This overall shot of the port undercarriage unit shows the small doors fitted in this area

All photographs ©W. Coffman

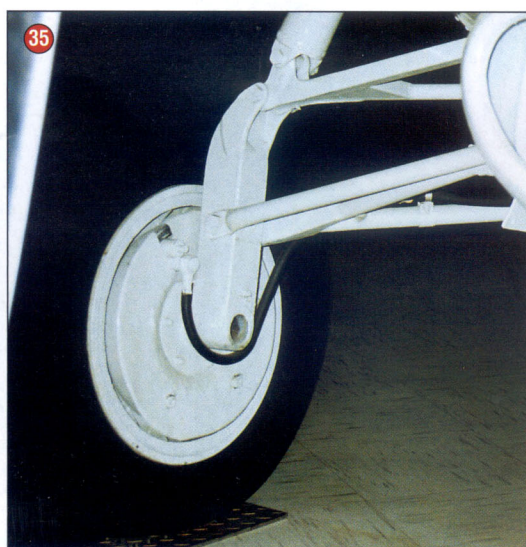




Photo Album

HEINKEL HE 162

by J.C. Carbonel



The Heinkel He 162 'Volksjäger' was the last jet fighter to reach a Luftwaffe Unit (Jagdgeschwader1). For this and other reasons, a large number of them were available to the Allies and then found their way into Museums.

W/Nr.120223 was photographed at the Musée de l'Air, le Bourget (North-east of Paris). This identification may not be correct as it seems the original tail unit was exchanged for the set belonging to another aircraft sometime during the life of the machine. 120223 is the number found on the tail unit during its restoration in the late '70s, 120227 is the machine currently on display at Hendon. This machine was test flown at the RAE Farnborough after the war; 120235 is the machine exhibited at the Imperial War Museum. All three are ex-JG1 machines. **MAM**

Model kits of the He 162

- Frog 1/72nd. Two marking options, both JG1 (reissued by Revell and its subsidiaries Congost and Kikoler)
- Lindberg 1/72nd
- Faller 1/100th
- Dragon DML 1/72nd (two versions including one in Mistel combination for 'Luftwaffe '46' fans. This version has been reissued by Revell AG)
- Dragon 1/48th (also issued by Hasegawa in Japan)
- Trimaster 1/48th, original edition of the Dragon kit
- ID Models 1/32nd vac-form
- Schmitts Modellbau, 1/200th resin

Note: A number of 1/48th vacform and resin kits were issued before the appearance of the DML kit, but are not listed above.

120223 is now exhibited at the Musée de l'Air after its restoration by an early group of Ailes Anciennes/IPMS France during the later part of the 1970s. Some questions are now raised by the green colour which may not be correct. When the aircraft was being restored, it was found to be painted in a strange medium green unlike the RLM 70 and RLM 71 which were known at the time. An approximate mix based on the worn paint samples obtained from the aircraft was therefore used to repaint it. Now that we are more familiar with the 'late-war colours', RLM81, RLM 82 and RLM 83, the results appear slightly off the mark. Note that guns have been removed from this aircraft.

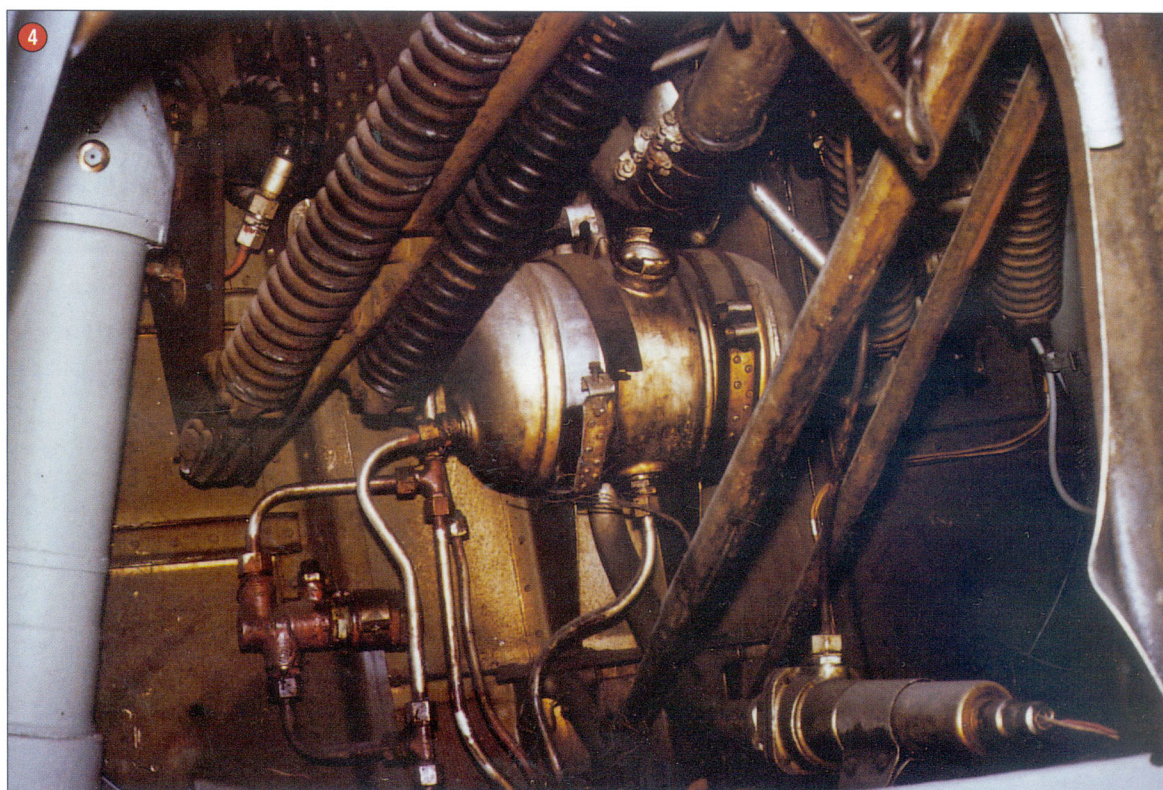
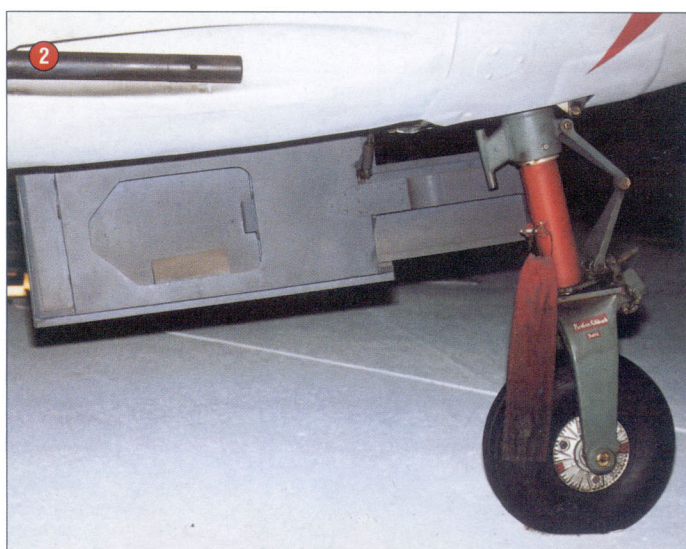
The same cannot be said of 120235, the Imperial War Museum exhibit which sports a rather dubious scheme. Its suspended presentation allows for a direct view inside the front wheel well which is astonishingly bare. Notice the window at the bottom to allow the pilot to check the extension of the landing gear.



1. 120227 is the Hendon machine complete with its guns. The colours and markings applied are much more consistent with what we have learned to expect of a He 162 than the 'French' machine.

2. The Hendon machine is perfectly finished, down to stencilling on the landing gear leg. Note the curious hook at the top rear of the leg and the details inside the door.

3. Returning to the IWM aircraft for a look at the main gear bays and legs. Of interest is the apparent thickness of the doors (look at the left door) [this is because they are made of wood - Group Editor] and the general uncluttered appearance of the bays. Fans of 'Luftwaffe '46' beware! This is all due to the location of the jet engine outside of the fuselage. The apparent simplicity of He 162 main gear bays cannot be extended to other advanced aircraft like the Messerschmitt Me P1101 or the Focke-Wulf Ta 183 which have the bays on the sides of the engine bay!



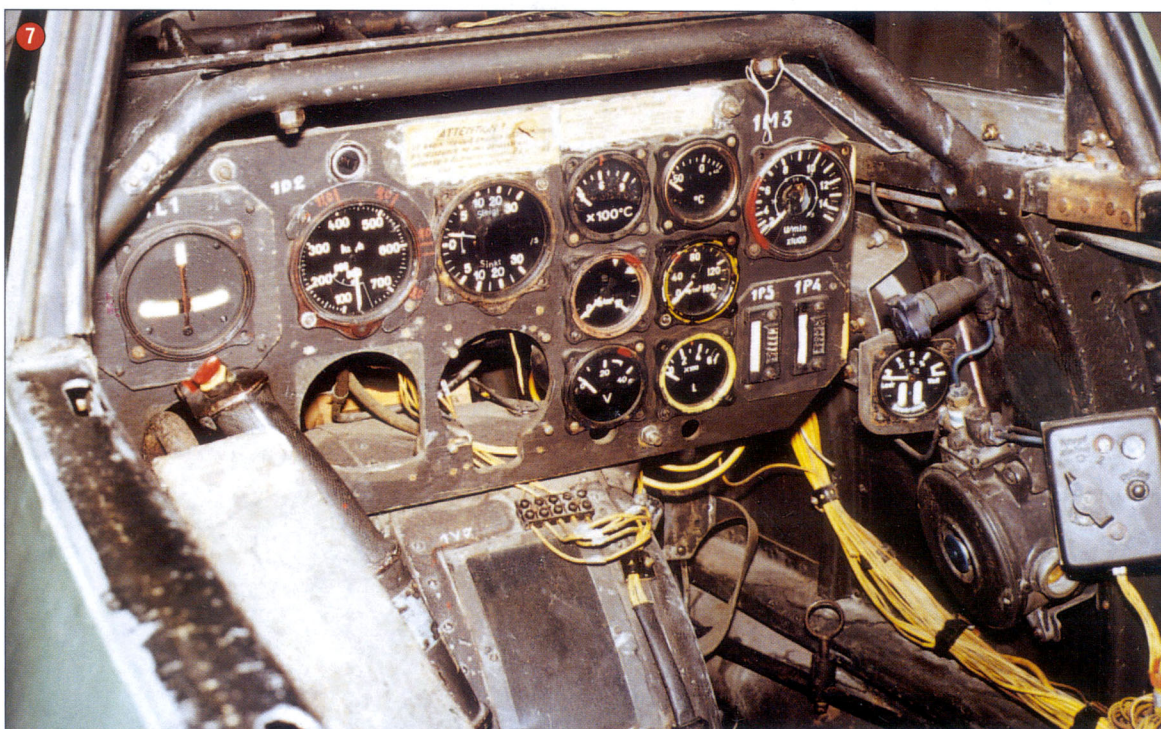
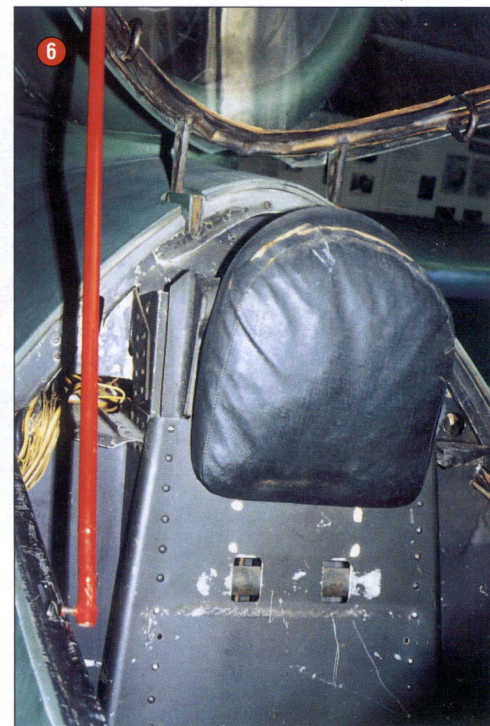
4. 'Under the skirts' of the French-preserved machine. Here we are close up on the front section of the bays, the retraction springs and a tank of unknown function. The whole area has not been touched by the restoration work and is still in its original colours which appear to be a kind of brown-greenish colour (a colour similar to Dark Earth has been found during the restoration of the Arado Ar 234 in the USA) with the tank in natural metal.

5. Another view of the main gear, this time from the Hendon machine, showing the brake control cable and the door actuation strut.

6. The open cockpit of the Musée de l'Air machine showing the top of the ejector seat, the hinges of the canopy and what seem to be hooks for the canopy lock mechanism. The red rod to keep the canopy open looks authentic.

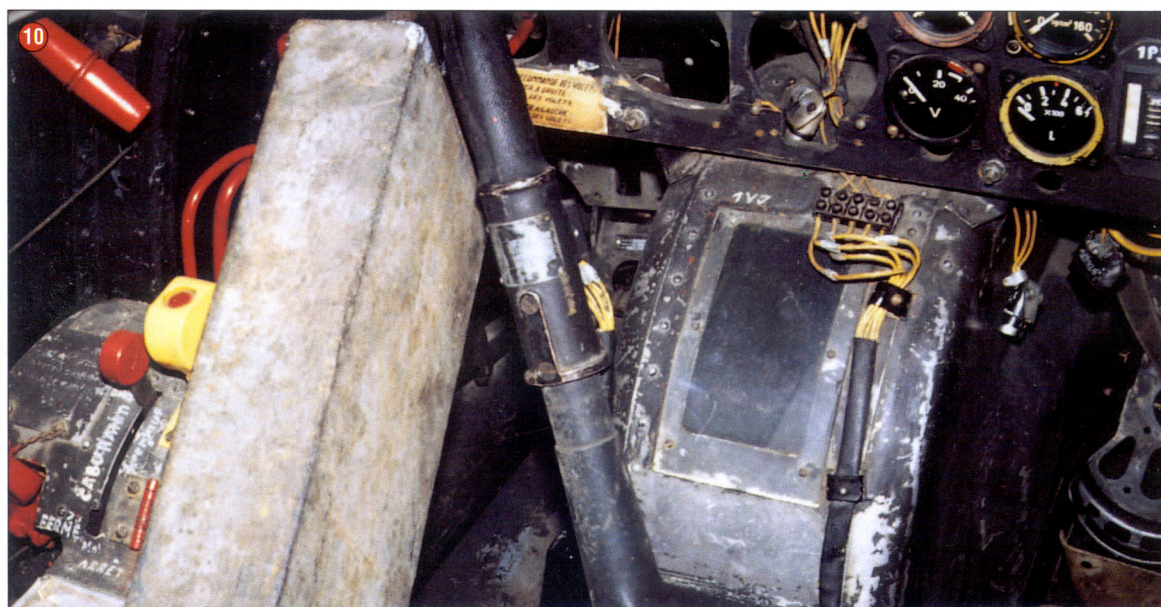
7. The control panel of the French machine with numerous Allied-added placards and tags. This part is also unrestored and appears as it would have been in 1946 during the inspection by the French Air Force of this captured German jet. The numerous yellow electrical cables snaking everywhere are noteworthy. The control stick is at full front left for ease of photography. The light grey rectangle to the left is a metal ballast thrown into the cockpit to compensate for the lack of guns. Note however that the guns are deposed but not the gunsight because it was never there! There is no place to mount it.

8. The right console of the French machine is obviously made of thin wood and cannot hide all the electrical cable snaking from it. The flimsy nature of the interior arrangement would look unauthentic if replicated in a movie!

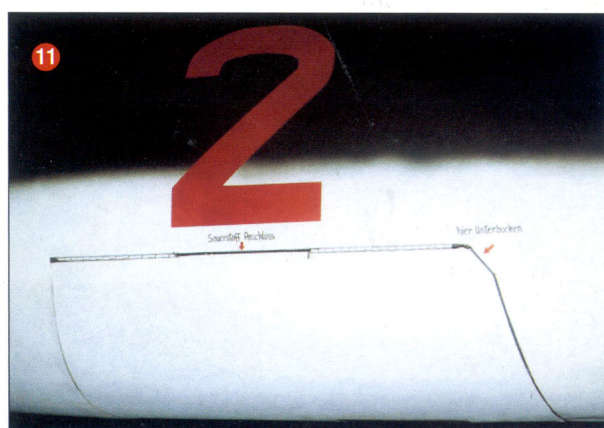




9. The 'deck' behind the control panel on the Hendon aircraft looks equally flimsy. Note the canopy lock mechanism awkwardly positioned so that it impairs the forward vision of the pilot.



10. Looking at the lower section of the control panel of 120223. The window allowing a view inside the nosewheel well is noteworthy. The bright colours of the colour-coded controls which can just be made out behind the ballast are striking.



11. The gunbay panel of 120227 with strange markings [The aft one 'Hier Unterboden' denoted the safe point at which to jack the airframe - Group Editor]. Why would the oxygen port (sauerstoff) be inside the gunbay? [Because the guns are cocked by compressed air - Group Editor]



12. Various conduits on the side of the engine pod of 120223. Even on such a smooth aircraft as the He 162 there is some apparent overlapping of sheet panels.

13. Looking towards the jet nozzle of the French aircraft.

14. The tail unit of the French aircraft. Colours of the vertical fin/rudder assembly were either all-light blue [RLM 76] (as seen here) or all-green.

